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part II

Volume 1, Number 2, Issue 02
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Brad Bird
Writer/Director of
The Incredibles, The Iron Giant

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March/April 2006

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MISSION STATEMENT

The mission of *Ultimate Home Design* is to serve as a catalyst for homeowners to create demand for architects, designers, and builders to adopt the concepts and building practices that define human-centered, optimum-performance home design. *Ultimate Home Design* is aimed at broadening the segment of the American population that is paying closer attention to the products they buy, looking beyond price and branding to focus on other elements of the production and value chain. Increasingly homeowners want to support sustainable building practices that result in a higher living standard. *Ultimate Home Design* is for those homeowners who want to promote a broader shift in patterns of production and consumption by encouraging practices that better reflect their personal values. We are advocates for using products that reduce energy and use renewable, recycled content or otherwise environmentally preferable materials. An important part of our mission is to promote building practices that result in a substantial reduction in energy use for space conditioning, water heating, lighting, and appliance operation. Another important aspect of our mission is to promote construction practices that improve the indoor environment and reduce the risk of building-related illness. This translates to improved occupant health and comfort by improving thermal comfort; natural lighting and electric illumination; and controlling humidity, odor, noise, and vibration.

Ultimate Home Design is for the thinking homeowner, who wants to be educated and learn about intelligent options for home design, whole-house system design, and comprehensive electronic lifestyle features that can enrich the quality of day-to-day life while reducing the cost of operating a home. With the knowledge gained reading *Ultimate Home Design*, you will be empowered to make intelligent choices about the design and make-up of your home, whether considering remodels or additions, planning a new home, or evaluating an already-built home. *Ultimate Home Design* will explore the wide range of possibilities within the context of designing Optimum Performance Homes™ that integrate universal design architecture; sustainable green building materials and techniques; energy-efficient power systems for electricity, lighting, heating, and air conditioning; water conservation techniques; and comprehensive electronic lifestyle features.

Premiere Issue And Back Issues: Issue 1 (Jan/Feb 2006)
Available back issues are in limited quantities and can be viewed online at www.UltimateHomeDesign.com

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Letters To The Editor

Letters To The Editor are welcomed via the U.S. Postal System, Fax, or E-mail. Regrettably our resources do not permit us to reply individually to every letter received. Our policy is to publish letters whose content, whether a position or question, reflects views on pertinent issues discussed in the magazine. Our mission is to provide a forum for discourse on the technology and creative issues that impact the Optimum Performance Home™ experience. We welcome contributions to our Readers' Feedback forum, both in the magazine and on the Webzine. We do not publish letters that do not credit the sender, nor without an e-mail or return address. *Ultimate Home Design*'s Readers' Feedback e-mail address is: **Gary@UltimateHomeDesign.com**.

News, Products, Events, And Editorial Submissions

E-mail news submissions to: **Gary@UltimateHomeDesign.com**. Direct all press releases, announcements, news, and calendar events to that e-mail address or send to the Temecula Office. Writers, both freelance and industry-supported, are invited to contact the publisher to discuss article submittals. Completed Optimum Performance Home™ project submittals for publication consideration are welcome. Manufacturers are invited to submit product releases that support the mission of the magazine.

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Phone: **951 676 4914** or Fax: **951 693 2960**
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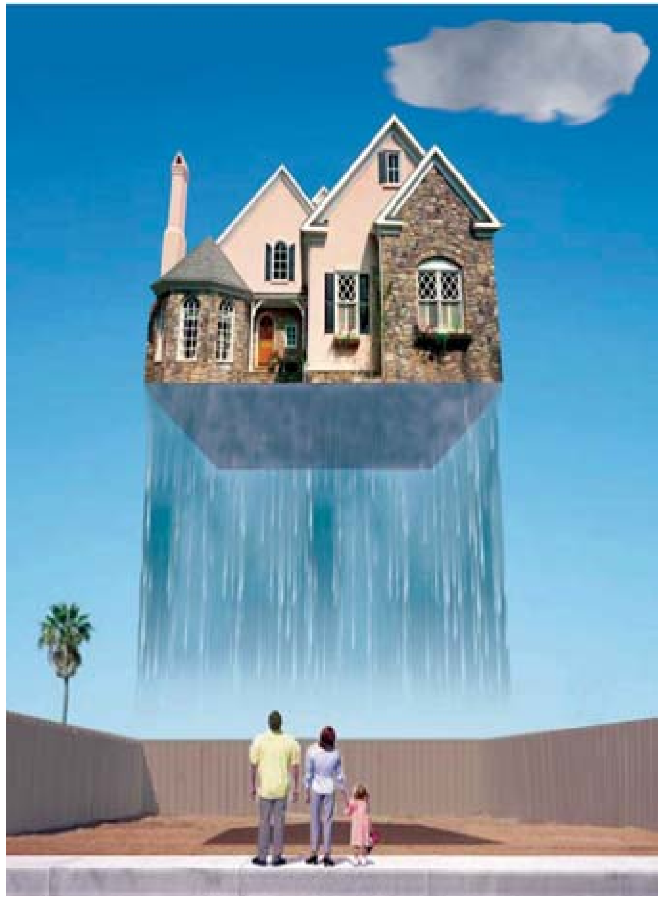

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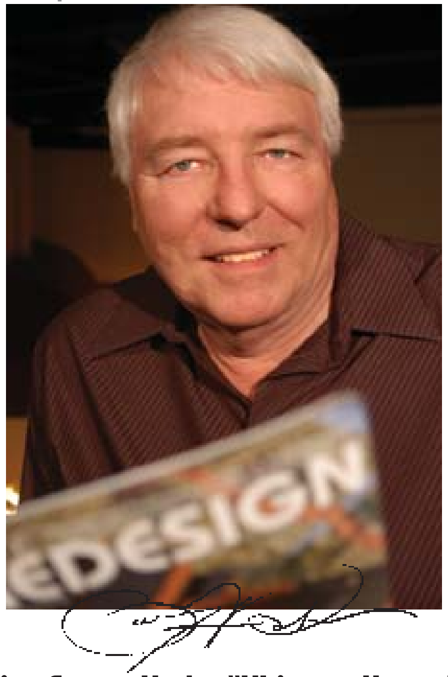

Building Steam Under "Ultimate Home Design™"

I want to thank our charter subscribers and advertisers for your support in the launch of this new magazine. As stated in our Premiere Issue, the magazine is intended to serve as a design and build resource for environmentally enhanced lifespan living. The magazine embraces the "Ultimate Home Design™" concept, which recognizes, respects, values, and attempts to accommodate the broadest possible spectrum of human abilities, regardless of age, ability, or physical stature, in the ergonomic design of products and environments that are easier to use and more aesthetically appealing, while optimally integrating sustainable green building practices and minimizing the overall impact on the natural environment.

The mission of *Ultimate Home Design* is to serve as a catalyst for homeowners to create demand for architects, designers, and builders to adopt the concepts and building practices that define human-centered, optimum-performance home design. The magazine is very unique in this respect.

Inside This Issue

In this issue, we publish Part Two on the case study series of the design and building of the first Optimum Performance Home™. This home project has been selected by the U.S. Green Building Council for inclusion in the prestigious LEED® (Leadership In Energy & Environmental Design) For Homes pilot program. The home is being constructed at The Sea Ranch, California, on the northern Sonoma County coastline of the Pacific Ocean, approximately 100 miles north of San Francisco and northwest of the world renown Alexander Valley, Napa Valley, and Sonoma wine regions. Bill Wilson, our Environmental Design Editorial Director, specifies the site preparation and engineering to optimize water conservation. This continuing series' purpose is to provide our readers with a responsible eco-friendly and universal design philosophy with respect to the approach taken with the Optimum Performance Home design concept.

Our featured green build home is The New American Home® 2006, an energy efficiency and innovation project sponsored by the National Association of Home Builders (NAHB) and showcased at the recent International Builders' Show in Orlando, Florida. This home is a "real-world" laboratory demonstrating concepts, materials, designs, and construction techniques that can be replicated—in whole or in part—in housing built any place and in any price range.

I've authored a tutorial on the "The Architect's Role As Designer And Implementer." This article is based on my experience in approaching home design and working with a team of design and engineering professionals on our Optimum Performance Home project.

Susan Mack, our Certified Aging-In-Place Specialist (CAPS), advocates that people should not buy, build, or remodel without consideration for universal design.

The Rainforest Alliance's SmartGuide to green building wood resources is written by Rick Hilton. This is an excellent compendium of Forest Stewardship Council (FSC)-certified flooring and sustainable wood building products.

Charles Kibert, Ph.D., discusses the green building boom and the resulting green building rating systems that are being applied across our nation to assess sustainable construction.

Our article on water-saving conservation is about the design of efficient-flushing low-flow toilets. No, the article is not recommending practices to save water by not flushing every time you use the toilet, though I presume that many people do so to save on their water bills. Instead, our article is about the performance of toilets, which are the biggest water guzzlers in anyone's home. Environmental engineering contributors Bill Gauley of Veritec Consulting, Inc. and John Koeller of Koeller & Company have conducted the most comprehensive and in-depth study of efficient-flushing low-flow toilet performance ever undertaken. Over 200 models of toilets are documented in terms of single-flush performance criteria for flushing the maximum number of solid waste grams with no more than 6 litres (1.6 gallons) of water.

Thank you again for your support, for without it we could not embark on this mission to explore how we can embrace environmentally responsible and smart home design concepts to enhance our lifestyles. UHD

BREAKING ground

State Of The Union: The Advanced Energy Initiative

In his State Of The Union Address on January 31, 2006, President Bush outlined The Advanced Energy Initiative to help break America's dependence on energy from foreign sources. The President has set a national goal of replacing more than 75 percent of our oil imports from the Middle East by 2025. "With America on the verge of breakthroughs in advanced energy technologies, the best way to break the addiction to foreign oil is through new technology. Since 2001, we have spent nearly $10 billion to develop cleaner, cheaper, and more reliable alternative energy sources," stated the President. Mr. Bush announced the Advanced Energy Initiative, which he said provides for a 22-percent increase in clean-energy research at the Department of Energy (DOE). The Initiative is expected to accelerate breakthroughs in two vital areas: how we power our homes and businesses, and how we power our automobiles.

Changing The Way We Power Our Homes And Businesses

President Bush said that his Administration will work to diversify energy sources for American homes and businesses. "Accelerating research in clean coal technologies, clean and safe nuclear energy, and revolutionary solar and wind technologies will reduce overall demand for natural gas and lead to lower energy costs." The President's Advanced Energy Initiative proposes speeding up research in three promising areas:

• The President's Coal Research Initiative: Coal provides more than half of the nation's electricity supply, and America has enough coal to last more than 200 years. As part of the National Energy Policy, the President committed $2 billion over 10 years to speed up research in the use of clean coal technologies to generate electricity while meeting environmental regulations at low cost. To tap the potential of America's enormous coal reserves, the President's 2007 Budget includes $281 million for development of clean coal technologies, nearly completing the President's commitment four years ahead of schedule.

The President's 2007 Budget Includes $54 million for the FutureGen Initiative. The FutureGen Initiative is a partnership between government and the private sector to develop innovative technologies for an emissions-free coal plant that captures the carbon dioxide it produces and stores it in deep geologic formations.

• The President's Solar America Initiative: The 2007 Budget will propose a new $148 million Solar America Initiative—an increase of $65 million over FY06—to accelerate the development of semiconductor materials that convert sunlight directly to electricity. These solar photovoltaic "PV" cells can be used to deliver energy services to rural areas and can be incorporated directly into building materials, so that there can be future "zero-energy" homes that produce more energy than they consume.

• Expanding Clean Energy from Wind: The 2007 Budget includes $44 million for wind energy research—a $5 million increase over FY06. This will help improve the efficiency and lower the costs of new wind technologies for use in low-speed wind environments. Combined with ongoing efforts to expand access to Federal lands for wind energy development, this new funding will help dramatically increase the use of wind energy in the United States.

Changing The Way We Power Our Automobiles

"The United States must move beyond a petroleum-based economy and develop new ways to power automobiles." The President wants to accelerate the development of domestic, renewable alternatives to gasoline and diesel fuels. The Administration will accelerate research in cutting-edge methods of producing "cellulosic ethanol" with the goal of making the use of such ethanol practical and competitive within six years. The Administration will also step up the nation's research in better batteries for use in hybrid and electric cars and in pollution-free cars that run on hydrogen.

• The Biorefinery Initiative: To achieve greater use of "homegrown" renewable fuels in the United States, advanced technologies need to be perfected to make fuel ethanol from cellulosic (plant fiber) biomass, which is now discarded as waste. The President's 2007 Budget will include $150 million—a $59 million increase over FY06—to help develop bio-based transportation fuels from agricultural waste products, such as wood chips, stalks, or switch grass. Research scientists say that accelerating research into cellulosic ethanol can make it cost-competitive by 2012, offering the potential to displace up to 30 percent of the nation's current fuel use.

• Developing More Efficient Vehicles: Current hybrids on the road run on a battery developed at the Department of Energy. The President's plan would accelerate research in next-generation battery technology for hybrid vehicles and "plug-in" hybrids. Current hybrids can only use the gasoline engine to charge the on-board battery. A "plug-in" hybrid can run either on electricity or on gasoline, and can be plugged into the wall at night to recharge its batteries. These vehicles will enable drivers to meet most of their urban commuting needs with virtually no gasoline use. Advanced battery technologies offer the potential to significantly reduce oil consumption in the near-term. The 2007 Budget includes $30 million—a $6.7 million increase over FY06—to speed up the development of this battery technology and extend the range of these vehicles.

• The Hydrogen Fuel Initiative: In his 2003 State of the Union address, President Bush announced a $1.2 billion Hydrogen Fuel Initiative to develop technology for commercially viable hydrogen-powered fuel cells, which would power cars, trucks, homes, and businesses with no pollution or greenhouse gases. Through private-sector partnerships, the Initiative and related FreedomCAR programs is expected to make it practical and cost-effective for Americans to use clean, hydrogen fuel cell vehicles by 2020. The President's 2007 Budget will provide $289 million—an increase of $53 million over FY06—to accelerate the development of hydrogen fuel cells and affordable hydrogen-powered cars. Through the President's program, the cost of a hydrogen fuel cell has been cut by more than 50 percent in just four years.

• There are an estimated 250 million vehicles on America's highways, and Americans will purchase more than 17 million vehicles in 2006. It will take approximately 15 years to switch America's automobiles over to more fuel-efficient technologies. The sooner breakthroughs are achieved, the better for America.

The Advanced Energy Initiatives put forth will build on the progress made since 2001. The President signed The Energy Policy Act of 2005, which promises to strengthen America's electrical infrastructure, reducing the country's dependence on foreign sources of energy, increasing conservation, and expanding the use of clean renewable energy.

Concrete Homes Offer Solid Ways To Reduce Energy Bills

This winter homeowners throughout the nation can expect their home heating bills to increase nearly 26 percent according to a recent Department of Energy forecast. In the State of the Union Address, President Bush announced the Advanced Energy Initiative (www.whitehouse.gov/news/releases/2006/01/20060131-6.html) directed at accelerating breakthroughs in alternative ways to power and heat our homes. One solid solution to rising energy costs is available today—concrete building systems.

A finished concrete home is indistinguishable from any other home in the neighborhood, until owners compare heating bills. One of the fastest-growing building systems is insulating concrete forms (ICF) where concrete is sandwiched between two-insulating layers of foam. Homes built with ICFs require 44 percent less energy to heat and 32 percent less energy to cool than comparable WOOD-frame homes. This can save the typical owner of a 2,000-square foot home in the central United States more than $250 in annual home energy costs. More energy-efficient homes also may require smaller heating and cooling units, reducing construction costs by as much as $2,000.

Concrete homes are inherently more energy-efficient than traditional wood-frame homes. The mass of concrete slows down the passage of heat moving through the wall, meaning that with the same amount of insulation, a concrete home stays warmer in the winter and cooler in the summer than a wood-frame home. Traditional wood-frame walls are a collection of components such as studs, drywall, sheathing, and insulation. Each joint and connection is a potential air leak. Concrete, however, forms a solid, continuous, and airtight wall that keeps heated and cooled air inside.

In 2004, 16.3 percent of the single-family homes built in the U.S. utilized exterior above-grade concrete wall systems, accounting for more than 226,000 homes. Several different concrete wall systems are available. In addition to ICFs, other systems include:

• Masonry—Uses concrete blocks to form the basic structure of the home.

• Removable concrete forms—Forms, typically made of aluminum, are filled with concrete to create walls, and then removed once the concrete has hardened.

• Precast panels—Walls are cast off-site, then assembled in large sections at the job site.

Aging And Independent Living

New research from the American Institute of Architects (AIA) reveals that although many "baby boomers" currently live an active lifestyle, they are designing their homes to accommodate a future decrease in mobility. Sixty-two percent of design firms reported that accessibility is a major factor in home design. Features such as wider hallways and fewer steps make aging-in-place a more, viable option for aging boomers in the years to come. Single-floor design is also gaining popularity with 29 percent of firms reporting an increase in demand for that plan. The survey is conducted quarterly with a panel of 600 architecture firms that specialize in residential construction.

A cornerstone of *Ultimate Home Design*'s mission is to encourage architects and designers to become more creative in designing comfortable and aesthetically pleasing homes to allow aging-in-place with far greater independent living and sustainable lifestyle benefits. UHD

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Sarah Scaglione

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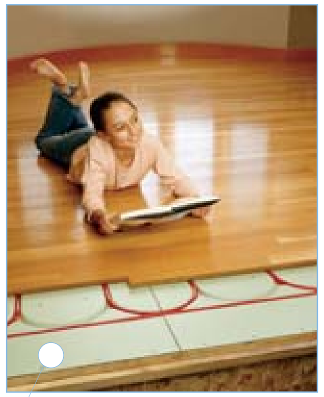
BEAM® Central Vacuum Systems offer affordable, deep-cleaning power, and improved indoor air quality. The Beam Serenity® Plus Central Vacuum System is the only central vacuum clinically proven to relieve allergies. With a motor up to five times more powerful than a typical upright, a Beam Central Vacuum System captures more dust, dirt, and allergens, and removes them from the living area. It also does not blow air into the room that can stir up dust. Available with the Serenity Plus power unit is the Beam Advocate™ Power Team™. The Advocate is a complete cleaning ensemble. The electric power brush features a chevron-shaped powerhead for maximum cleaning performance and a full set of cleaning tools to provide floor-to-ceiling cleaning. 800 947 2326 www.beamvac.com

Whirlpool® Duet Sport™ HT and Duet Sport™ Washer and Dryer Pairs deliver exceptional performance and easy operation while conserving resources. These contemporary front-loaders deep clean large loads using half the water and energy required by traditional top-load washers. The dryer speeds drying time to help finish laundry fast. Each pair's compact design is flexible enough to install just about anywhere—whether stacked, under-counter, or on optional comfort-height 15.5-inch pedestals . The dryer's large, reversible door and four-way venting provide additional installation flexibility. Duet Sport HT and Duet Sport pairs are ENERGY STAR® qualified for 2007. 866 698 2538 www.whirlpool.com

Finnleo® Saunas Wish you could soothe away aches and pains, increase your metabolism, and improve your blood circulation, as well as maintain healthy skin, all in a healthy environment? Now you can with Finnleo Finnish Sauna. Offering unlimited options and residential sauna accessories, Finnleo has excelled at bringing you Europe's latest design concepts and renowned quality. Finnleo's Designer Saunas exude clean, contemporary style, and quality craftsmanship. Topping the "best seller" list is the Amberlight Sauna. Amberlight features Saunatec's® exclusive heat storing "Saunatonttu" heater that is ready at a moment's notice. No more waiting for the sauna to heat up, the Saunatonttu heater uses innovative technology to store heat in the massive rock base and allow the homeowner to simply open the lid when ready for use. This unit boasts stunning curved designs, low-voltage lighting, and integral shelves. 800 346 6536 www.finnleo.com



Warmboard® Radiant Subfloor, the radiant heat system that connects builders, architects, and homeowners—the smart way. For homeowners—Warmboard's patented technology is claimed to deliver the most energy efficient radiant heat available. In fact, Warmboard is compatible with solar or geothermal heat sources, making it even easier to heat new homes in an environmentally sensible way. Using a Warmboard system also means no restrictions on floor coverings and improved indoor air quality—all adding up to a radiant heat system that is healthy, comfortable, and remarkably efficient. For builders— Warmboard is the only structural subfloor and radiant panel, all in one. You have to put down a subfloor anyway; with Warmboard you install a high-performance radiant panel at the same time. No extra framing, no extra joists, no extra subcontractors. The best radiant system for your clients and easy, labor-saving installation for you. For architects—specifying Warmboard is easy. It is the subfloor! No extra design loads, no extra framing considerations. Warmboard provides a custom set of plans for each job as well. Just provide a CAD file and Warmboard does the rest. Free information kit available. 877 338 5493 www.warmboard.com

Hearth And Home Technologies™ You've heard of a hydrogen-powered car, but have you heard of a hydrogen-powered fireplace? Heat & Glo™, a brand of Hearth & Home Technologies, Inc., introduces the world's first hydrogen-burning fireplace, the Aqueon™. The Aqueon revolutionizes fireplace design by extracting and burning hydrogen found in water without releasing harmful air pollutants such as carbon monoxide and nitrous oxide into your home. This stunning addition to any room doesn't require venting or sealed-glass enclosures, so it can offer a 360-degree view of an open flame. The Aqueon improves indoor air quality by helping replenish oxygen into the home. This spectacularly designed fireplace can be installed anywhere in your home, merely supply the unit with water and electricity. If the Aqueon doesn't fit your budget, Heatilator® offers the affordable and attractive supplemental heat source in the new Caliber™ NXT direct vent gas fireplace. The Caliber NXT boasts greater than 70 percent heating efficiency, especially formulated for homeowners looking to beat high home heating costs. 800 927 6841 www.hearthnhome.com

Best Bath Systems of Boise, Idaho, has been a pioneer in adaptable bathing products since 1972. As the desire for universally designed bathrooms increases, Best Bath Systems continues to offer an array of stylish design options in easy-access bath and shower enclosures. Included in the extensive product line are one-piece and multi-piece units that comply with the American Disabilities Act (ADA) standards. Also offered is a collapsible water retainer that allows the user to step in, or roll in with their wheelchair, with minimal effort. Best Bath uses an elegant polyester Gelcoat finish, available in solid colors, to provide a "classic tile" appearance. Accessories include: shower valve, matching soap dish, glide bar/hand shower, and curtain and rod. To further ensure homeowner safety, shower units come equipped with walls that are backed by 1/2-inch plywood to facilitate the placement of safety hardware. 866 433 6646 www.best-bath.com

Good Cooking: The New Basics With Jill Dupleix

Headquartered in San Francisco, California, Reel Food Entertainment and Silverback Books have teamed together to bring you the next revelation in home cooking. Released in 2005, *Good Cooking: The New Basics With Jill Dupleix* is a DVD-based cookbook featuring award-winning chef/author Jill Dupleix. Jill Dupleix, the Times Cook, is one of the UK's most influential and inspirational food writers. The amazing CookDisc™ is highly interactive and offers the home chef dozens of specially selected video recipes, shot in high-definition. The CookDisc also includes intelligent options such as 110 searchable and printable recipes, suggested menus, wine pairings, and substitutions, and provides ability to send recipes and ingredients to one's email, and/or Web-connected phones and PDA's. This state-of-the-art CookDisc offers consumers an easy-to-use and entertaining cooking resource. All special features are playable on any standard DVD player or any computer equipped with a DVD drive. Bring the future of cooking into your home. 951 676 4914 www.ultimatehomedesign.com

Gerber® Plumbing Fixtures, LLC

introduce Ultra Flush®, one of the highest performing and best toilet values available. Ultra Flush technology utilizes the standard water supply to pressurize the air inside the tank and drive water into the bowl with accelerated force, providing superior waste removal and bowl cleaning. The Gerber Ultra Flush 1.1 gpf toilet represents the latest in water conservation efficiency. Gerber's unique siphon-jet action, superior waste removal and bowl cleaning is achieved with just 1.1 gallons per flush. Not only are the Ultra Flush toilets incredibly efficient, but they are also available in a full complement of colors, styles, and sizes. 847 675 6570 www.gerberonline.com

Salton™, Inc.

Want to check your email while you wait for the vegetables to simmer? Salton, Inc. makes life simpler with its Beyond™ Connected Home product line, a series of network-able devices focused in the kitchen. The Beyond iCEBOX™ Flipscreen offers a sleek design and fits neatly under standard kitchen cabinets. The wipe-clean 12.1-inch flat anti-glare LCD monitor provides exceptional picture quality and allows the user to watch television, browse the Web, watch a DVD, or even connect a video camera for complete home monitoring. The inconspicuous screen rotates and pivots to any viewing area and folds away when not in use. The iCEBOX even comes equipped with a revolutionary remote and keyboard that are wireless and washable, allowing the user to also listen to FM Radio or a favorite CD from anywhere in the kitchen. 877 463 7637 www.beyondconnected-home.com

Takagi Tankless Water Heaters

Taking center stage with the unveiling of their T-H1, Takagi, introduces the newest addition to their groundbreaking Takagi Flash Water Heater line. This Energy Star® product delivers more hot water in less time due to a pre-heating and built-in neutralizer system. The pre-heating system employs dual heat exchangers that heat water in a virtually instant two-step process. Packed with greater efficiency, the T-H1 is capable of delivering an unprecedented 10.2 gallons per minute. At 28 inches high, 19 inches wide, and 12 inches deep, the T-H1 weighs 92 pounds and can be wall-mounted either indoors or outdoors. Applications for T-H1 include: domestic water heating, space heating, radiant floor heating, indirect heating, re-circulation, and combination heating systems. To reduce your energy bill today, phone 866 356 9190 or visit www.takagi.com

PRODUCT showcase

Square D® Clipsal®

Schneider Electric announced this year the launch of their ground-breaking and urbane line of residential lighting control under the brand name Square D Clipsal. The expansive line of products include dimmers, relays, movement sensors, and input devices such as switches and touch screens crafted in sleek European styling. Square D Clipsal lighting control systems include timers to control when lights turn on/off and dimmers to adjust lighting levels, and the entire system is configurable to meet your specific needs. Attractive European design is portrayed in the Neo and Saturn style keypads. Both contain the pioneering Dynamic Labeling Technology that makes it easier than ever for homeowners to find their way in a dark or poorly-lit room. A glowing blue LED is also present to instantly show the user the status of switches. Be a part of one of the fastest growing trends in sophisticated yet simple lighting control with Square D Clipsal. 888 SQUARED www.us.schneider-electric.com

WireTracks®

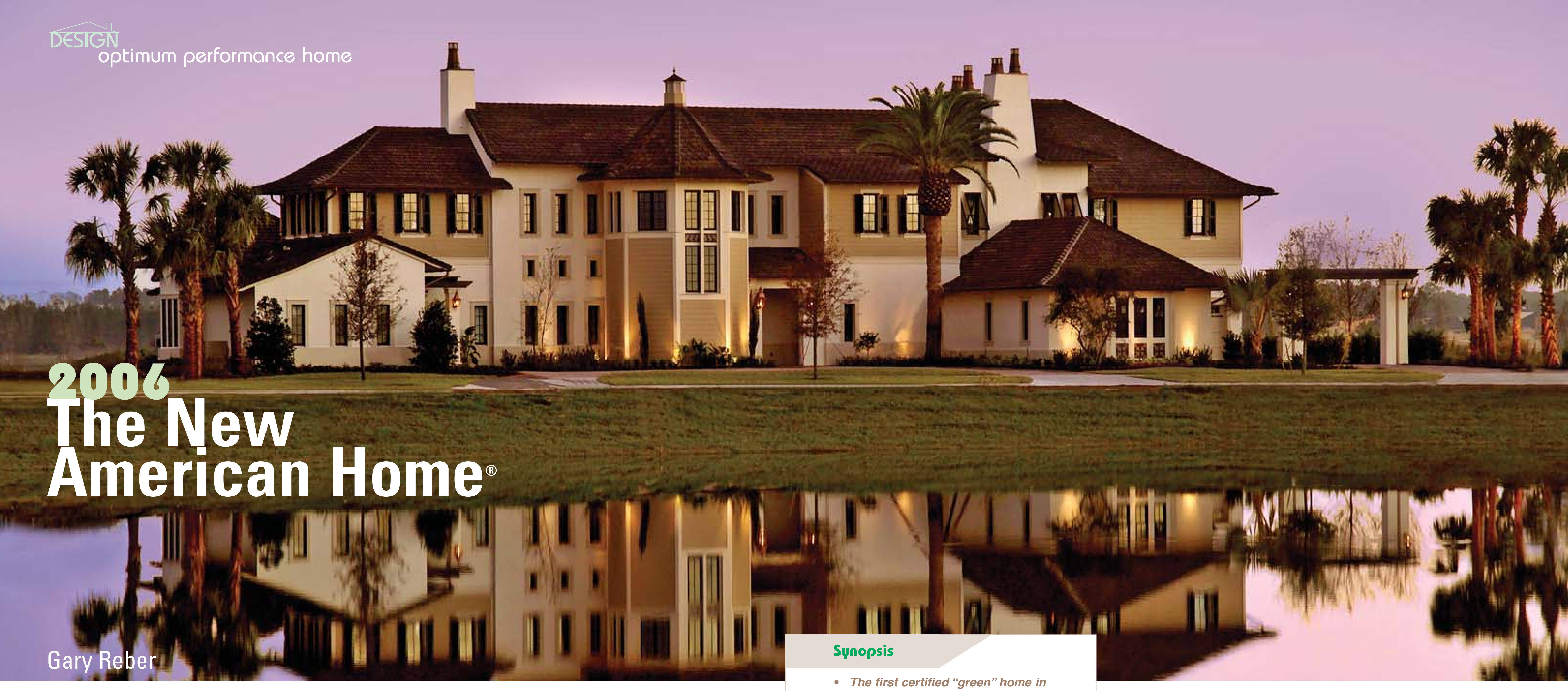
Are you building a home and unsure about how much wiring to install? Are you trying to figure out where everything should be located? Do you have an existing home that is difficult to rewire? WireTracks may be the answer for you. WireTracks, LLC, manufactures wiring channels that hide behind standard baseboard, chair rail, or crown molding. Once installed, your moldings become removable wire covers; you can pull them off at any time, run new wiring, and simply snap shut. WireTracks works perfectly with newly constructed homes as well as remodels. When used with remodeling, they can solve a simple wire routing problem. When installed throughout a new home, they let you bring new wiring to any point in the house at any time in the future without damaging walls. Contact the company for architectural drawings, installation instructions, or ordering information. 888 886 9473 or visit www.wiretracks.com

Eaton Corporation

Ever gone on vacation and suddenly worried that you didn't turn off the coffee pot or close the garage door? Relieve your stress and gain "peace of mind" with the ultimate in home awareness. Eaton Corporation has developed Home Heartbeat™, a wireless, plug-and-use home awareness system to remotely monitor safety, security, and comfort issues. This responsible system provides updates on home appliances, the status of doors and windows, routine maintenance schedules, and oversees comings and goings of family members. Home Heartbeat acts as a monitoring device and will alert you of pertinent issues. It will also remind you of simple tasks like taking out the trash or feeding the fish. Home Heartbeat also allows you to be connected to your home from anywhere and at anytime. Receive email or text message alerts when the system detects anything wrong inside your home. Also receive alerts when your child gets home from school or if an elderly housemate needs attention. Meant to be installed by the homeowner, Home Heartbeat is the answer to superior home control. 800 813 2199 www.home-heartbeat.com

Brew Express™

by Lance Larkin™ offers the first truly built-in-the wall and self-filling coffee system for the home. This elegantly designed twelve-cup, stainless steel unit saves countertop space by installing easily and efficiently into the wall. It even draws water from a direct supply or bottled-water source for added convenience. Versatile for any hot water need, Brew Express incorporates unique safety and convenience features. Safety features, aimed at avoiding common burns, include a base and carafe that are not hot to the touch, and a sensor that ensures brewing stops if you remove the carafe. Brew Express is also easy to remove, maintain, and clean. 866 268 5953 www.brewexpress.com



2006 The New American Home®

Gary Reber

Synopsis

- *The first certified "green" home in the history of NAHB's New American Home program.*
- *Attention is paid to green design and sustainable building, the fluid merging of indoor and outdoor spaces, and the application of the principles of universal design, creating a home that will meet the needs of the homeowner throughout the different stages of his or her life.*
- *The home is a "real-world" laboratory demonstrating state-of-the-art building concepts, designs, and construction techniques and materials that can be replicated—in whole or in part—in housing built in any place, in any climate, and in any price range.*

Introduction

The New American Home® was the official featured home sponsored by the National Association of Home Builders (NAHB) at the 2006 International Builders' Show held in Orlando, Florida from January 10 to 14, 2006.

Each year, since 1984, the NAHB builds a house in the host city of its International Builders' Show convention to showcase "state-of-the-art" home-building techniques and materials.

The show home is part of an initiative to test new concepts, materials, and techniques that improve efficiency and home performance and can be used in homes of any price range. It serves as both a showcase of new home features and a living laboratory where partners in the home-building industry can test their latest methods.

The New American Home's mission is to show that "housing performance" can be incorporated into the most simple or most complex homes, and that it's equally as important as aesthetics.

The New American Home was a big attraction at the annual show. The home is a "real-world" laboratory demonstrating state-of-the-art building concepts, designs, and construction techniques and materials that can be replicated—in whole or in part—in housing built in any place, in any climate, and in any price range. The design, construction, and amenities are market-driven, and showcase the latest in innovative products for the future of home building. It is a collection of

"The New American Home's mission is to show that 'housing performance' can be incorporated into the most simple or most complex homes, and that it's equally as important as aesthetics."

International Builders' Show

Each year for the International Builders' Show, The New American Home® transforms from a graded plot into a truly unique home in style and function. The one characteristic shared by each home since the U.S. Department of Energy's Building America Program has participated in the project is energy efficiency. This year's home achieves high levels of efficiency through advanced HVAC equipment, careful installation of insulation and air sealing, high-performance windows, and a zone control system. Among its interesting features is a hot water system that taps energy from solar thermal panels. The home's overall achievements in energy use are 61 percent reduction in heating and cooling and 50 percent reduction in hot water when compared to a similar home.

A Strong Energy Portfolio For A Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

Research And Development Of Buildings

Our nation's buildings consume more energy than any other sector of the U.S. economy, including transportation and industry. Fortunately, the opportunity to reduce building energy use—and the associated environmental impacts—are significant.

DOE's Building Technologies Program works to improve the energy efficiency of our nation's buildings through innovative new technologies and better building practices. The program focuses on two key areas:

- Emerging Technologies

Research and development of the next generation of energy-efficient components, materials, and equipment

- Technology Integration

Integration of new technologies with innovative building methods to optimize building performance and savings

For more information contact EERE Information Center at 877-337 3463 (www.eere.energy.gov)

Primary Project Goals:

- Build a high-profile show home for the International Builders' Show by implementing Building America strategies to conserve energy and materials
- Introduce production builders to advanced HVAC strategies and advanced insulation and airtightness detail

Specifications:

- Four high-efficiency heat pump units
- Average 15 SEER for cooling
- All air-handling equipment and ductwork within conditioned space
- Attic unvented, sealed, and indirectly conditioned
- A thermal (R-30) and air barrier at the underside of the roof sheathing (Icynene™ spray foam insulation)
- Fully ducted return system, with the exception of jump ducts that maintain a balanced pressure region in bedrooms
- High-performance windows with a spectrally selective low-emissivity coating reduce cooling and heating loads
- Air distribution systems with performance targets of 100, 120 (2), and 200 cfm with leakage rates of, respectively, 65 cfm (3 percent), 67 cfm (6 percent), 85 cfm (7 percent), and 47 cfm (5 percent)
- Three tankless water heaters for water heating in a timely fashion with no standby losses
- 39 percent total whole-house energy savings

ideas for homeowners and the building industry to incorporate into hundreds of thousands of new and remodeled homes across the country constructed each year.

A blend of comfort and the picturesque with high-performance innovations, the 2006 New American Home was designed for a young retiree or someone nearing retirement who requires a very large home positioned to enjoy seclusion on the shores of Lake Burden in southwest Orange County, Florida. The home is located at 11525 Center Lake Drive, Windermere.

The location influenced the design of a long, shallow two-story house with a British-Caribbean flair reminiscent of Spanish-style architecture that offers a lake view from nearly every room. The middle section of the 10,023 square foot home (7,367 square feet conditioned space) is only one-room deep. A variety of points of interest were incorporated to guide the eyes across the home's front elevation, including a two-story tower with a spiral staircase.

The very large home offers formal parlor and dining room; great room; four bedrooms; four full and two half-baths; club room; home theatre/fifth bedroom; spa/sixth bedroom with balcony; home office with separate entrance and library loft; three laundries, one with large hobby room; and three plus one-car garage. On the exterior, ground floor and second-floor loggias, each with their own summer kitchen, provide uninterrupted views of the lake and infinity-edge swimming pool with heated spa and its own palm tree islands. The home also boasts five fireplaces (three indoor and two outdoor), gas lamps and torch lighting for the pool, and four stairways (circular stair at the tower, a spiral stair in the office, interior stair in the family room, and an exterior stair connecting the loggias).

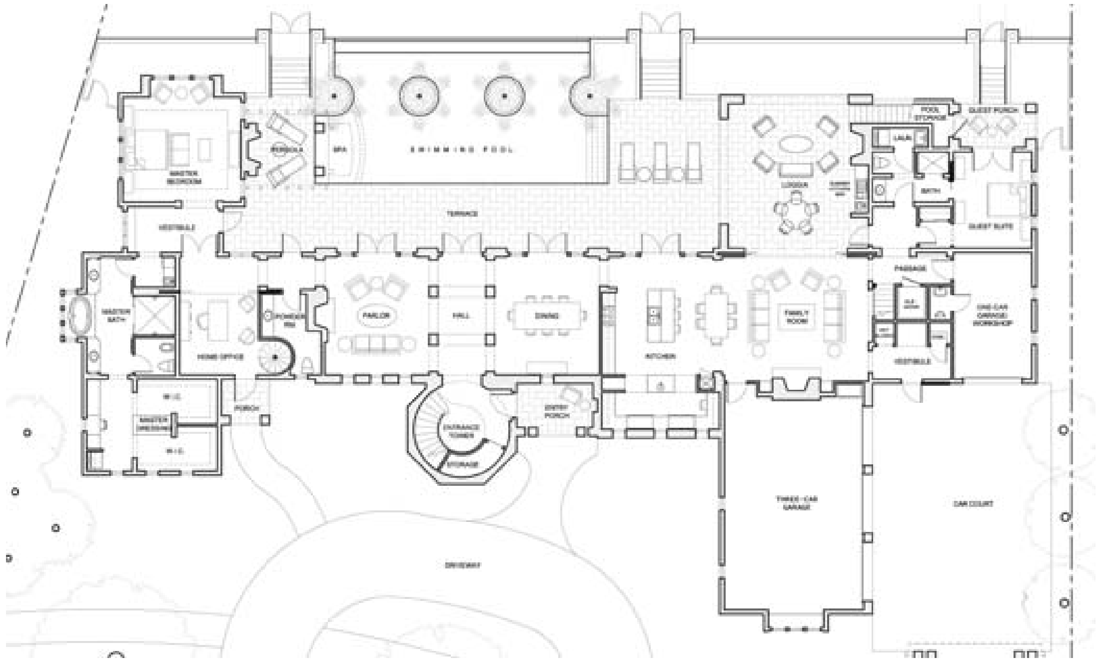
The home features a universal design layout on both floors with access to the second floor provided by an elevator in addition to the stairs.

Demonstrating New Home Technologies

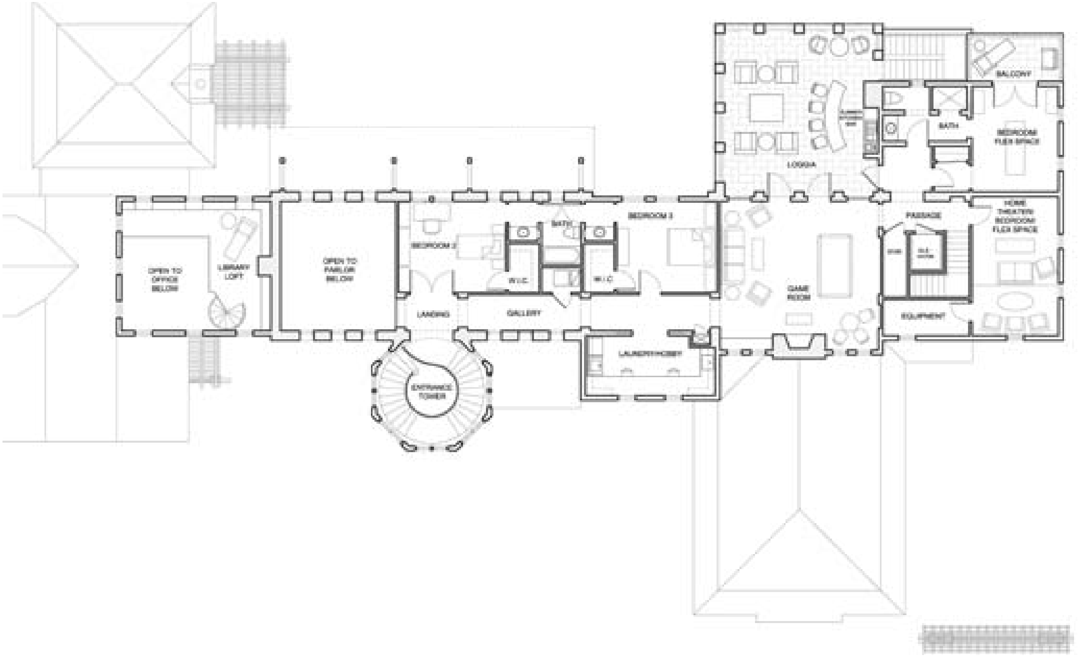
The New American Home is an annual project focused on the future of home building. Co-sponsored by The National Council of the Housing Industry (NCHI)—The Supplier 100 of the National Association of Home Builders (NAHB)—and the trade magazine *BUILDER*, the project teams up industry experts for the purpose of designing, building, and monitoring a demonstration home that has been equipped with the latest, marketable home technologies and products. The NCHI, a committee of the NAHB chartered in 1964, is comprised of nationally known, trusted, and recognized product and service suppliers to the housing industry who are committed partners.

The design, construction, and amenities showcased are donated by NCHI members, making The New American Home a highly visible

The first floor plan of The New American Home® 2006 exhibiting a linear layout to take maximum advantage of lake views along the rear of the property. Private spaces are located at the ends, such as the master bath and closet on one side and the guest suite, and one-car garage (topped by spa room and home theatre) on the other. Note the universal design and access to the elevator and rear stairs.



The second floor plan of The New American Home® 2006.



in-kind sponsorship program. For a complete listing of New American Homes built from 1984 to 2006 and under construction in 2007, and a list of NCHI members' participation in The New American Home by year, visit "Facts And History" on www.tnah.com.

Completed for the International Builders' Show, the 2006 New American Home is a showcase of cutting-edge features and innovations that are accessible, in whole or in part, by builders across the country for application in their own homes. Of note is the attention to green design and sustainable building, the fluid merging of indoor and outdoor spaces, and the application of the principles of universal design, creating a home that will meet the needs of the homeowner throughout the different stages of his or her life.

The New American Home was built by Hannigan Homes, Inc. (www.hanniganhomes.com) in southwest Orange County, Florida in the Lake Burden at the Lakes of Windermere subdivision, on the shores of Windermere's Lake Burden, with architectural design by WCI Architecture & Land Planning, Inc. (www.wcicommunities.com), landscape design by Redmon Design Company

Building America's Systems-Engineering Approach

Building America (www.buildingamerica.gov) is a research program of the U.S. Department of Energy (DOE) with the goal of designing and building zero energy cost homes. Building America's systems-engineered approach unites segments of the building industry that have traditionally worked independently of one another. Building America forms teams of architects, engineers, builders, equipment manufacturers, material suppliers, community planners, mortgage lenders, and contractor trades.

The concept is simple: systems-engineering can make America's new homes cost-effective to build and energy efficient to live in. Energy consumption of new houses can be reduced by as much as 50 percent with little or no impact on the cost of construction.

To reach this goal, Building America teams work to produce homes that incorporate energy- and material-saving strategies from design through construction.

First, teams analyze and select cost-effective strategies for improving home performance. Next, teams evaluate design, business, and construction practices within individual builder partnerships to identify cost savings.

Cost savings can then be reinvested to improve energy performance and product quality. For example, a design that incorporates new techniques for tightening the building envelope may enable builders to install smaller, less expensive heating and cooling systems. The savings generated in this process can then be reinvested in high-performance windows to further reduce energy use and costs.

The "pilot" or "test" home is the field application of solution design. Teams build prototype homes according to strategic design, then test each system for efficiency, and then make any necessary changes to increase efficiency and cost effectiveness. Before additional homes are built, these changes are incorporated into the design. This process of analysis, field implementation, re-analysis, and design alternation facilitates ultimate home performance once a design is ready for use in production or community-scale housing.

Understanding the interaction between each component in the home is paramount to the systems-engineering approach. Throughout design and construction, the relationship between building site, envelope, mechanical systems, and other factors is carefully considered. Recognizing that features of one component can dramatically affect the performance of others enables Building America teams to engineer energy-saving strategies at little or no extra cost.

Advantages To The Homeowner
- Increases quality without increasing cost
- Increases comfort and performance
- Reduces utility bills
- Allows greater financing options

Advantages To The Builder
- Reduces construction costs
- Improves productivity
- Improves building performance
- Reduces callback and warranty problems
- Allows innovative financing as a result of predictably lower utility bills

Physical Specifications

Measurements Are In Feet And Inches

Home Overall:
149' Long x 82" Deep
12' Ceilings Ground Floor
10" & 12" Ceilings Second Floor

Ground Floor:
Entry Porch: 6'8" x 11'8"
Entrance Tower: 14'8" Round x 30' High
Hall: 6' x 18'
Parlor: 16' x 18' x 26' High
Formal Dining Room: 16' x 18'
Kitchen: 17' x 26'
Family Room: 19' x 23'
Loggia: 22' x 21'
Home Office: 12' x 18' x 24' High
Master Bedroom: 16' x 18'
Master Dressing Suite: 14' x 20'

Ground Floor (continued):
Guest Suite: 12' x 14'8"
Three-Car Garage: 32' x 21'4"
One-Car Garage: 12' x 19'4"
Car Court: 25' x 41'
Swimming Pool: 18' x 44'
Pool Court: 72' x 30'

Second Floor:
Library Loft: 8' x 12'
Bedroom 2: 12'8" x 15'
Bedroom 3: 12'8" x 14'
Laundry/Hobby: 8'4" x 18'
Game Room: 22' x 20'8"
Loggia: 22' x 20'8"
Bedroom 4/Spa: 12' x 14'8"
Home Theater/Bedroom 5: 12' x 19'4"

(www.redmondesign.com), and interior design/merchandising by Saxon-Clark (www.saxonclark.com). This is the first time an in-house architect for a builder/ developer was selected for the annual project.

Hannigan Homes worked with IBACOS (Integrated Building and Construction Solutions), a U.S. Department of Energy Building America partner, to develop an energy-efficient design. Through the use of innovative technology and design practices, the home achieves nearly 45 percent whole-house energy savings. To reach this level of energy efficiency, IBACOS provided assistance in designing the home's systems and in choosing efficient technologies.

During its first year, The New American Home will serve as a "real-world" laboratory of new building products and technologies. IBACOS will monitor the home's temperature and humidity to ensure a comfortable living environment. This research will be used by Building America to improve the design of future high-performance homes.

Integrating New Technology To Conserve Energy

The 2006 New American Home was built to demonstrate the "green" philosophy, making the home friendly to the environment by using as many earth-friendly materials as possible. With the implementation of the Florida Green Building Coalition Green Home Designation Standard, The New American Home is the first certified "green" home in the history of The New American Home program. The design is ideal for cross ventilation when the air conditioning is turned off. Other energy and conservation features include HEPA filtration for clean indoor air, a roof gutter system that will collect rainwater to irrigate the landscaping, and mulch made from recycled construction materials.

The energy features in The New American Home can be used in homes at any price with equivalent energy savings.

Features And Benefits

Among the top benefits of The New American Home is energy efficiency. The home uses 61 percent less energy for heating and cooling, and 50 percent less energy for water heating, compared to a similar house in this hot and humid climate zone. Each component of the home was selected and integrated into the project through a systems approach of designing, testing, and redesigning. All of the components work together to achieve maximum home performance. The home's thermal qualities, for example, are achieved through a combination of proper sizing of the mechanical

The one-room deep slab-on-grade foundation.

The two-story design incorporates an assortment of building materials, including wood-fiber siding, exterior stucco, and concrete roof tiles.

Overhanging roofs provide shade and reduce solar heat gain.

Materials, such as extruded polystyrene panels and housewrap, provide a drainage plane and contribute to the home's insulation qualities and moisture prevention.

Building America's Systems—Engineering Approach (continued)

- Gives builder a competitive advantage

Systems Engineering Cost Saving Trade-offs
- Advanced framing systems
- Tightly sealed house envelopes
- Shorter, less costly ductwork
- Engineered and planned infrastructure
- Smaller, less expensive mechanical systems
- Modular construction

Percentage Of Energy Reduction
- 64 percent reduction in cooling energy use
- 13 percent reduction in heating energy use
- 50 percent reduction in hot water energy use

Performance Features

Thermal Shell
- Exterior concrete block walls, R-5 extruded polystyrene insulation on inside face
- Roof/ceiling, R-30 polylcynene low-density spray-foam insulation
- Attic venting eliminated preventing the entry of unwanted outdoor hot moist air

Airtightness
- The airtightness of the concrete block exterior wall increased by placing extruded polystyrene insulation directly against it without any gaps between joints
- Airtight spray-foam insulation at the underside of the roof decking and wall transitions; foam sealing around penetrations through the building enclosure

Moisture Control
- Windows and doors effectively flashed to shed water
- Flashing integrated with the drainage plane system to increase home durability
- Extruded polystyrene insulation on the inside face of the concrete block exterior wall controls moisture diffusion from the outside to the living space

HVAC
- Electric air-source heat pumps (SEER 15, HSPF 7.8)
- Air handlers and ductwork located in conditioned attic space
- All joints and connections within the air distribution system sealed with approved water-based mastic
- Dedicated, fully ducted return air ductwork integrated into each air distribution system

Hot Water
- Three tankless water heaters (EF = 0.82) minimize piping and reduce standby losses

Interior Air Quality (IAQ)
- Bath vents and the kitchen fan ducted to the outside; ventilation system supplied to each air handler

For information contact:
- Hannigan Homes—407 843 5858
- National Council of the Housing Industry—800 368 5242 x8519 (www.nahb.org)
- IBACOS Consortium—800 611 7052 (www.ibacos.com)

A whole-house wiring system provides an efficient network of controlled and integrated electronics.

R-5 extruded polystyrene panels, mounted continuously inside the exterior walls, improve insulation qualities.

Open-web floor trusses eliminate obstructions, allowing efficient installation of ductwork and other services.

equipment, insulation materials and specifications, and designing the ductwork to fit within the conditioned space. Innovations improve efficiency even more, such as the use of thermal solar panels in the hot water system.

IBACOS Participation

To ensure efficiency and innovation, Building America team member IBACOS, Inc., provided design and engineering support and performance testing and monitoring. As a result, the home is conditioned by high-efficiency heat pump units (SEER 15.5 average) and uses zone control to maintain ideal temperature settings in the home's six zones. Each unit and its associated ductwork are within conditioned space. This is because the attic was sealed, at the underside of the roof deck, with spray foam insulation, to prevent outside air from entering. Additionally, specially coated windows will help preserve a comfortable indoor climate.

Indoor And Outdoor Use Of Space

Today's families are increasingly merging indoor and outdoor spaces, and outdoor living has taken on a whole new look. Rudimentary patios with the prerequisite lawn chairs and charcoal grills have been replaced; homebuyers are more and more looking to create outdoor "rooms" with all the same amenities and comforts offered in their interior spaces.

As entertaining at home has become more popular, so has the demand for porches, decks, and courtyards for entertaining. The New American Home 2006 anticipates this demand, offering both expansive ground floor and second floor loggias, which take full advantage of the lakefront views. Outside spaces flow seamlessly into interior spaces thanks to walls of doors that slide fluidly into hidden pockets. On the first floor, an "endless pool" with an infinity edge and heated spa appears to melt into the lake. Gas lamps and torch lighting frame the pool and add drama to the landscape, and a striking water curtain falling from a trellis provides a soothing backdrop to the loggia.

Homeowners are increasingly requesting summer kitchens, complete with counters, sinks, refrigerators, and built-in grills. The New American Home offers two—one for each loggia. Furniture that will survive the hot summers, cold winters, and the occasional downpour is also in-demand. While The New American Home's carefully-selected designer furnishings include teak and wicker pieces that will stand the test of time, popular chains like Lowe's and Pottery Barn have also begun offering affordable and stylish weather-resistant outdoor furniture, from entertainment centers and couches to lamps and artwork. The television has

High-performance windows with impact resistant properties are installed throughout the home to limit solar gain.

also taken its place outside, as evidenced by the widescreen flat-screen sets that grace the exterior walls of The New American Home.

One needs not experience Florida's temperate climate to enjoy their outdoor rooms year-round. The addition of outdoor heaters, fire pits, or outdoor fireplaces (The New American Home has two) allow for outdoor entertaining even when the temperatures drop. The old paradigm of bringing the outdoors in has shifted and designers are more and more often bringing the indoors out. Today, outdoor entertaining has the potential to be as luxurious and convenient as indoor entertaining. Though The New American Home offers more than 10,000 square-feet of indoor/outdoor space, for those with smaller homes, outdoor rooms are a clever way to extend entertaining space.

Creating Homes For Splitters

In the next five years, the number of second homes in America will double to nearly 12 million. To put that in perspective, that's the equivalent of roughly the entire populations of Massachusetts, Connecticut, and Rhode Island owning a second home.

This new breed of second-home owners, known as Splitters, is helping to shape a new, mobile American way of life that until recently could only be realized by those with last names like Vanderbilt, Rockefeller, and Kennedy. And Splitters are making economic impacts beyond the real estate industry. From telecommunications to travel, Splitters are influencing the way Americans are doing business.

With abundant shopping, close proximity to Florida's beaches, and the theme parks of Disney and Universal Studios just minutes away, Orlando is a perfect getaway for a second-home buyer looking to kick back and enjoy some fun in the sun. That also makes it an appealing spot for Splitters who expect visiting children and grandchildren. However, it's true that the owners would never even have to leave The New American Home to feel like they've been on vacation. With a media room, game room, spa-room, and resort-style infinity pool and spa (complete with palm tree islands), the home is equipped with every possible amenity.

The home also has plenty of space for visitors, with four extra bedrooms and a dedicated guest suite on one side of the house. With all these attributes, it's entirely possible that guests may overstay their welcome. The home's master suite comes complete with morning kitchen and laundry, so hosts theoretically could avoid crossing paths with their guests if they needed an escape.

Splitters are busy people. When they arrive in their second home destination, they want to be able to hit the ground running,

A massive, multilevel island is the centerpiece of the home's amply appointed kitchen.

A dramatic pool view along the back edge of the terrace features concrete planter columns.

A whisper-quiet fabric-care system that is ENERGY STAR® compliant with comfort height pedestal drawers.

A pullout wire-shelf pantry that extends storage area threefold.

not spend hours in the car driving in from the airport. Most Splitters are saying that a home within a one hour's drive from a major airport is best—especially for those accommodating out-of-town business associates. For this group, The New American Home also does not disappoint. The home includes a dedicated first-floor home office with second-floor loft library. With a separate entrance from the rest of the home, the office offers complete privacy for conducting business at the home, or the second home as the case may be.

Although The New American Home might cater to a more affluent buyer, across the country Americans of all ages, incomes, and motivations are splitting their time between more than one home. For more information on Splitters, visit www.splitters.com.

New Realities For Boomers

The first wave of America's 76 million-plus "baby boomers" turn 60 this year. As this group heads into retirement, they're having a profound effect on the housing market, and their needs and preferences are shaping the way that developers, architects, and architectural designers are building homes.

Baby boomers have a different view of age-restricted housing than their parent's generation. A new emphasis on active living has made communities with recreational amenities like golf, biking, fitness centers, and nature trails more popular. More and more boomers, especially at the younger end of the spectrum, are choosing multi-generational communities that market to buyers of all ages, and homes that will accommodate their needs as they move through their child-raising years and into "the next stage" of their lives, which may or may not include retirement. Many of these families will have the added demand of providing for adult children and grandchildren returning to the nest and/or accessible housing for aging parents. That plays in to the recent trend toward larger retirement homes and the application of "universal design" principles to architectural plans.

The New American Home anticipates and plans for these changing realities for "boomers." With in-home amenities like a media room, game room, and lakefront spa room with massage table, the home certainly appeals to someone with an active lifestyle. However, the home—with elevator—was designed to be almost 100 percent wheelchair accessible so it will be suitable for the resident as he or she ages or brings an elderly parent into the home. A fully-equipped guest suite on one side of the house could easily serve as an in-law suite for guest, live-in housekeeper or caregiver, returning children, or senior housing for parents.

Green And Sustainable Building

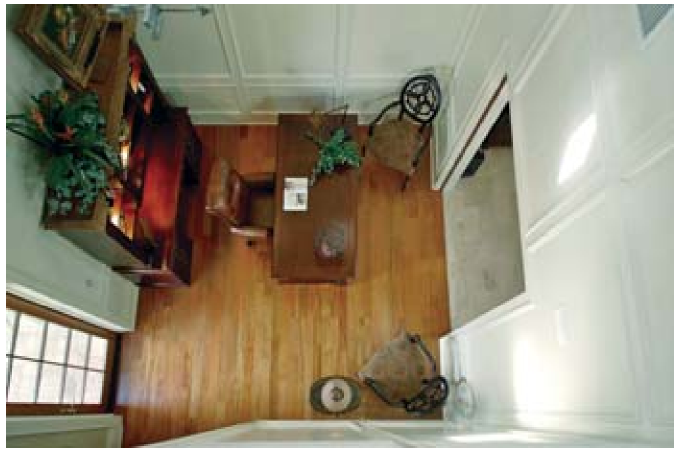
One of the reasons that the WCE Architecture & Land Planning, Inc. was chosen as the architect of record for The New American Home 2006 was their experience with and commitment to sustainable design and construction. In fact, WCI holds the distinction of having built "the greenest home in Florida" certified by the Florida Green Building Coalition (FGBC). That home, the Casa Verde model at the Venetian community in Venice, Florida, is only one of hundreds of certified green homes that WCI has designed, built, and certified as part of their environmental stewardship initiative. At WCI Communities, Inc., green is more than just a buzzword; it's a way of building livable homes that are healthy, energy efficient, and resource efficient.

Often misunderstood, green building and green architecture is incorrectly associated

with aesthetically awkward structures constructed from spare tires and sod roofs. The truth about green building is that it is a systems approach to design and construction that can have no impacts on the aesthetics desired by a homebuyer. As the design and construction industries implement additional environmentally responsible features, the green building movement is becoming more mainstream. Homebuyers understand the benefits resulting in a smarter home choice that can look and cost the same as traditionally built homes.

There is no universal standard of what constitutes green building, but the design and construction teams for The New American Home worked with consultants representing the FGBC (www.floridagreenbuilding.org) and the U.S. Department of Energy's Building America program to make sure the most applicable environmentally responsible choices were made. The home is certified green, based on the FGBC's Green Home Certification Standard, which requires a minimum of 200 points be achieved in eight categories each with required category minimums. Categories include elements of energy and water conservation, material/resource efficiency, and healthy home features that are included during the home's construction. This year's home is the first certified green home built through The New American Home Program since it began in 1984.

Beginning in the early design phases, the team was mindful of environmentally-conscious choices. The shallow depth of the house makes it ideal for cross ventilation, and the deep overhangs and loggias help keep out the radiant heat from direct sunlight. Exterior walls have insulation on exterior and interior faces to reduce heat transfer, which means the home uses less energy for cooling and heating than traditional concrete block walls. Sealing the building envelope with Icynene, a sprayed expanding foam insulation applied under the roof, saves energy by stopping heat and humidity from penetrating the exterior of the home



The home office provides an interesting space to suit the needs of a home-based business.

A fully-equipped workshop occupies the single-bay garage on one side of the motor court. A wall-hung and modular/mobile system of cabinets, workbenches, and other storage options still leaves plenty of space for working on a motorcycle or sports car.

(versus batt insulation laying at the ceiling trying to hold back hot attic air). This high-performance insulation, in combination with air conditioning ducts running through the equivalent of conditioned spaces and a high SEER AC system, provide a house that is 50 percent more efficient than if built to standard building codes, and 20 percent more efficient than an ENERGY STAR® house.

Other green features include doors, windows, and trim constructed with wood from sustainable forests—an environmentally responsible choice; high-efficiency "Storm Force" doors and windows—providing durability during storms; high-efficiency electronic air filters—providing improved indoor air quality; a tankless "instant" hot water heater—reducing energy use up to 50 percent for water heating; ENERGY STAR clothes washer—saving up to 6,000 gallons of water per year and reducing energy by over 20 percent; non-hydrochlorofluorocarbons (HCFC) free air condition refrigerant—protecting ozone levels; a roof gutter system that collects rainwater for use in landscape irrigation—keeping water on the watershed and minimizing rolloff; and a water-efficient landscape design that uses mulch made from recycled materials—conserving resources.

Conclusion

In conclusion, The 2006 New American Home is exemplary of large home architecture incorporating new concepts, materials, and techniques that improve energy efficiency and home performance applicable to homes in any size or price range. UHD

2006 The New American Home® Credits

About The Author

Gary Reber is the President of Ultimate Home Design, Inc. and the founding Editor-In-Chief and Publisher of *Ultimate Home Design* magazine. His diverse background in several fields includes an undergraduate, graduate, and postgraduate university education in architecture, community planning, and economic development planning. For years he was a consultant on community and economic development planning. For the past 15 years he has been an editor and publisher of magazines in the consumer electronics field. Gary can be reached at 951 676 4914 or gary@ultimatehomedesign.com.

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Credits

Since 1984, The New American Home® has brought together the world's leading suppliers and the best of consultants and valued trade partners to assist the design-build team. This year's contributors are recognized as follows:

Supplier 100 Member Contributors

- AVAD (integrated electronics)
- Canac Kitchens (cabinetry)
- ClosetMaid (closet storage systems)
- Dal-Tile Corp. (ceramic, glass, metal tile)
- Dryvit Systems (exterior finish coat stucco)
- Eaton's Electrical Business/Cutler-Hammer (backup generator, service load center and subpanels, circuit breakers, other electrical components)
- Flowguard Gold/Noveon (CPVC pipe, fittings)
- Formica Corp. (quartz surfaces/tops)
- GAMA/Vent-Free Gas Alliance (Maxitrol Co.; quick-release propane gas connectors)
- GE Appliances (kitchen appliances)
- General Motors (boat)
- Georgia-Pacific (drywall, tile backer board)
- Gladiator GarageWorks by Whirlpool (garage storage system)
- Hanley Wood, LLC (media sponsor)
- Hearth & Home Technologies (Heat & Glo fireplaces)
- Hilti (tools)
- HomeTeam Pest Defense (termite protection)
- Honeywell (climate controls/thermostats and electronic air cleaners)
- IBACOS Consortium/National Renewable Energy Laboratory (design/engineering consulting, energy performance testing and monitoring)
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- Kahrs International (certified sustainable wood flooring)
- Kohler Co. (plumbing fixtures and fittings, bath accessories)
- Lennox Industries (heating and cooling equipment)
- Loewen (windows, outswing patio doors)
- Louisiana-Pacific Corp. (structural decking)
- Lutron Electronics Co. (lighting controls)
- ODL (tubular skylights)
- Oldcastle Architectural (concrete pavers, retaining wall)
- Overhead Door Corp. (garage doors and openers)
- Owens Corning Corp. (Cultured Stone fireplace surround)
- Pactiv Building Products (rigid foam insulation, housewrap)
- Phantom Manufacturing (retractable insect screen)
- Portland Cement Association (masonry blocks, Redi-Mix concrete, labor costs)
- Progress Lighting (interior recessed lighting, exterior low-voltage lighting)
- Propane Education & Research Council (propane gas components)
- Riggs Workwear by Wrangler (work clothes)
- Rinnai Corp. (tankless propane water heaters)
- Scripps Network/HGTV-Pro (media sponsor)
- Shaw Industries (carpeting)
- Simpson Strong-Tie Co. (framing connectors)
- The Closet Factory (master suite built-ins/storage)
- ThyssenKrupp Access Corp. (elevator)
- Tyco Fire & Building Products (fire sprinkler system)
- Whirlpool Corp. (laundry equipment, ironing center)

Other Contributors, Suppliers, Trade Partners, and Consultants

- A-1 Block Corp. (specialty concrete masonry block)
- Acoustiblok (sound control membrane)
- Adams Building Materials (roof and floor trusses)
- Adirondack (interior trim labor)
- Advantage Glass & Supply (shower enclosure and mirror insulation)
- Aggressive Appliances (appliance supply and installation)
- All Pro Painting (painting labor)
- All-Safe Pool Safety Barriers (pool barrier)
- American Surveying & Mapping (site surveying)
- Apex Sauna & Wine Cellar (wine cellar)
- Architectural Elegance (exterior shutter supplier)
- Atlantic Shutter Systems (exterior shutter supplier)
- Beaver Door and Trim (interior trim material)
- Bella Luce Design (exterior low-voltage lighting)
- Cast Crete (precast concrete lintels)
- Cemex (base coat stucco, masonry materials, Redi-Mix concrete)
- Charleston Gas Light (gas light fixtures)
- Chicra Dock Builders (dock builders)
- Clean First Time (new-home construction cleaning services)
- Creative Tile Installations by Carolyn (tile installation)
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- D.R. Masonry (masonry labor)
- Davey Fire Sprinklers (fire sprinkler system installation)
- Del Air Electric and HVAC (electrical and HVAC systems supply and installation)
- EcoQuest International (water and air purification)
- Elegant Foam International (exterior trim substrate)
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- Farris Floor Systems (Gyp-Crete installation)
- Ferguson Enterprises (plumbing fixture consulting)
- Florida Concrete & Products Association (masonry and concrete products)
- Florida Rock (masonry materials)
- Formworks (formed and poured structural concrete labor)
- Four Seasons Gas (gas piping and fixtures installation)
- Frame Rite (structural framing labor)
- Garage Design Works (decorative epoxy floor and garage storage system installation)
- Gary's Quality Mirrors & Glass (mirror and glass installation)
- General Works (roof tile installation)
- Global Alarm (security system supply and installation)
- Hamway Flooring (hardwood floor installation)
- Harriss Pools (swimming pool contractor)
- HB&G (balcony railings)
- Holloway Plumbing Co. (plumbing supplies and installation)
- Hontz Elector (dumbwaiter installation)
- Hoppe North America (door hardware)
- Hunter Fan Co. (ceiling fans)
- Independent (range hoods)
- Inland Materials (Redi-Mix concrete)
- Lakefront Designs (landscape materials and installation)
- Larry Abney (decorative precast mantles, range hood installation)
- Lawn Logic (irrigation and moisture sensors)
- Matthew Prettyman Installations (window and door installation)
- MonierLifetile (concrete roof shingles)
- Newman Crane Insurance (insurance)
- No-Burn (fire-resistant framing coating)
- Paver Systems (paver installation)
- Precast Designs (decorative precast concrete mantles and range hood supply)
- Prestige Granite & Marble (granite countertop fabrication and installation)
- Prestige Lumber (framing material supply)
- Renaissance Finishes & Coatings (epoxy.polyurethane garage floor)
- Re Shaw Concrete (monolithic slab and exterior concrete applications)
- Ride-N-Our Elevator (elevator installation)
- Rinker Materials (masonry materials, Redi-Mix concrete)
- R.K. Edwards (drywall installation and finishing)
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- Snaplock Industries (garage floor finish)
- Solartite (sliding pocket glass door installation)
- Spacelift (automatic attic storage lift)
- StairWorld (spiral stair)
- Summit Lifts (dumbwaiter)
- Superior Plastering (exterior stucco finish coat installation)
- Tarmac (masonry materials, Redi-Mix concrete)
- The Flooring Center (carpet installation)
- The Sherwin-Williams Com. (paints and coatings)
- Trackside Products (Formica quartz surfacing installation)
- Trinity Tile Group (tile installation)
- United Subcontractors (insulation installation)
- West Orange Siding (exterior trim, siding, trellis work, shutter installation)
- Whisper Wings (landscape, grading, trash removal, irrigation)
- Wilson Technologies (integrated electronics installation)
- WinDoor (sliding patio door)
- Yovaish Engineering (geotech engineering)

The First Optimum Performance Home™

site planning part II

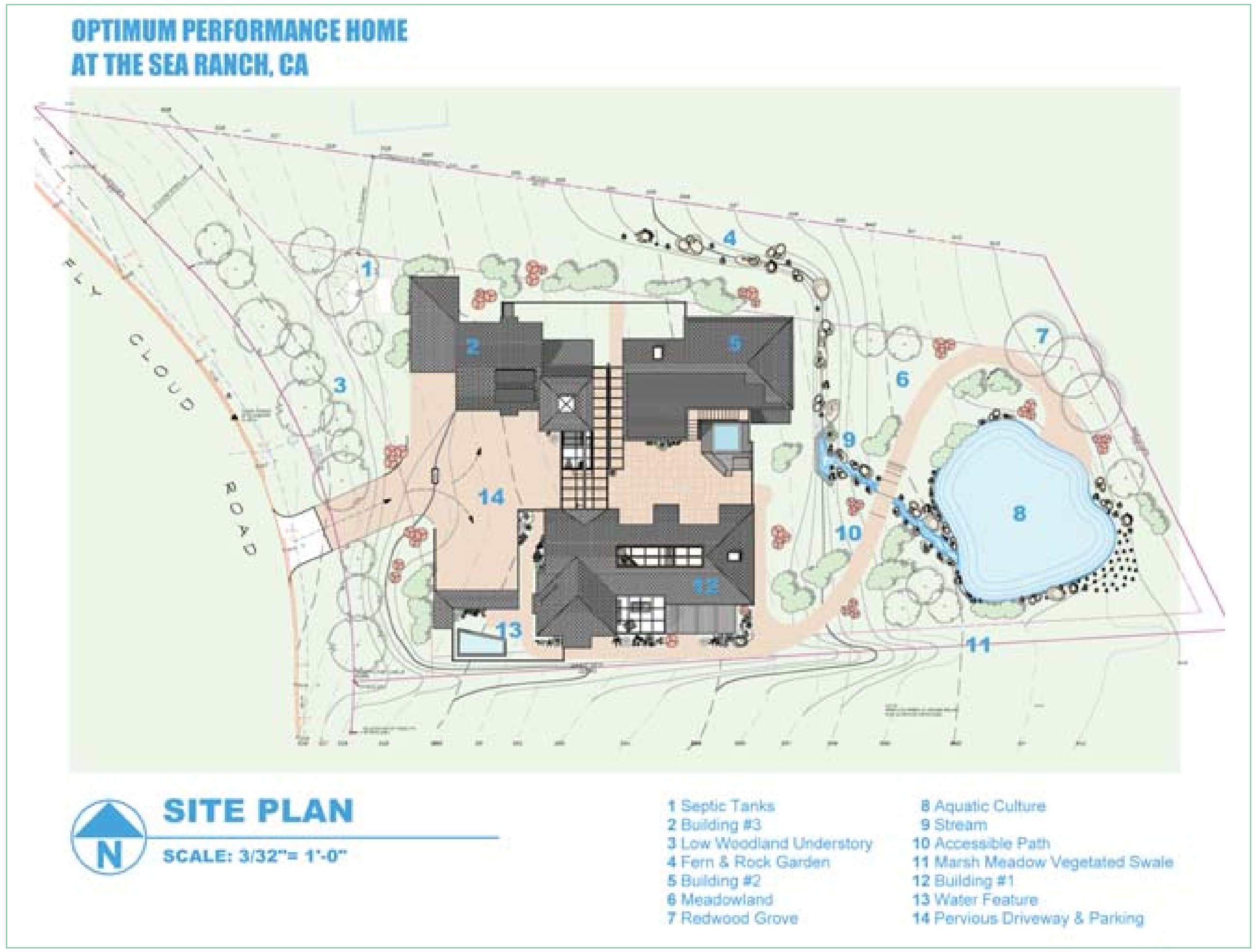
Gary Reber

Introduction

This is the second article in the series documenting the design and construction of the first Optimum Performance Home™. The project has been selected by the U.S. Green Building Council (USGBC) for inclusion in the national Leadership In Energy And Environmental Design (LEED®) for Homes pilot program, their new green build certification initiative. The home will be built at The Sea Ranch, located in Sonoma County along the Northern California coastline of the Pacific Ocean. The showcase project is exemplary of the "Ultimate Home Design™" concept, which integrates universal design with the best sustainable building practices while exerting minimal impact on the environment. A building science systems approach to home building is the cornerstone of the project with emphasis on the relationships between the home's components and the envelope they create. Also paramount is good stewardship—proper regard and respect for the rights of neighboring homeowners, resource efficiency, and the surrounding natural setting. The goal is to optimize occupant health, comfort, and safety; maximize energy efficiency and structural durability; and minimize environmental impact. In addition, the aim is toward providing a nurturing home environment to support independent living and sustainable lifestyles.

The home design integrates all of the concepts advocated in Ultimate Home Design™. I conceived the "Optimum Performance Home" and "Ultimate Home Design" concepts, and had a vested interest as this would not only be my home but my office as well. My goal was to demonstrate how today's products and building methods can make life safer, more comfortable, and more enjoyable. The science of optimum performance homes is about building structures that use less energy, are quieter and more comfortable, have fewer problems with materials degradation, provide clean air and water, and do less damage to the environment. As an integrated holistic design, the house will serve as a home for many people and serve in many phases in one's life.

DESIGN
optimum performance home



The site plan for the Optimum Performance Home at The Sea Ranch showing the relationship of the three-building compound to the site

A Case Study

The approach I am taking with this series of articles on designing and building the Optimum Performance Home at The Sea Ranch is to present a case study, which details every phase in the design and building of this home project.

For our readers who have not personally experienced such a process, I believe that this serialized documentation will be enlightening and beneficial to approaching your own home design and building project (see "The Architect's Role As Designer And Implementer"). Of course, this is our

"The single most important element in the design and construction of a home is the actual site, as the natural environmental factors dictate how your home should be designed and built, and how it should be situated."

Synopsis

- *Site-specific design and construction lay at the very heart of sustainability.*
- *Sustainable site design is an approach to the land, beginning with an understanding of the important natural resources of a site, the impacts of the proposed project, and a philosophy that seeks to first reduce impacts and then to mitigate impacts through better design.*

The floor plan of the Optimum Performance Home delineating the three-building compound arrangement and covered walkways

experience and not all aspects of our approach will apply to your project. Nonetheless, there will be aspects of our approach that will be educational and useful. I hope that, as a result, you will be rewarded with a better appreciation of the extent of commitment necessary to successfully design and build a new home.

Please understand that this is a real-life project scenario and that to date we have yet to break ground and lay the foundations. Therefore, expect that some issues of *Ultimate Home Design* will have more coverage of this project than others, depending on the construction stage we are in at any given time over the course of the next year.

Space Design

In designing the Optimum Performance Home at The Sea Ranch, we had to analyze the activities that my wife Marlene and I engage in. Both Marlene and I are active in our companies and our home needs to reflect our personal needs and requirements, as does yours.

Accordingly, a good home design may include inside and outside spaces, big and small spaces, and shared and individual spaces. It will also incorporate a transition, hopefully smooth, from more public space, like entries and foyers, to semi-public space, like living rooms, to private space, like bedrooms. The bottom line is that home design is really all about spaces and how they are integrated together. The quality of your activities, and thus, really, your life, are affected by the qualities of the spaces in which they occur. Defining spaces includes analyzing the size of the home, orientation, and degree of privacy.

There is always an area or size of space that works and feels best, both functionally and psychologically. This is where personal needs and requirements play a major factor in the design of a home. What works for one person may not necessarily be optimized for someone else.

Design Committee Oversight

At The Sea Ranch, a Design Committee, appointed by the elected Board of Directors of The Sea Ranch Association, a Common Interest Development, has, in essence, the "authority" to regulate house size and bulk. As it turns out, this issue was central to the numerous denials that we encountered throughout the design review process for this project.

The early designs attempted to organize the interior spaces within a single structure to reduce cost of construction. However, as such, the size of those early designs appeared to the Design Committee to be out of character with the size of existing homes in the "neighborhood" designated by the Design Committee. Therefore, the Design Committee required that a neighborhood bulk study be prepared for preliminary design review in order to identify the challenges that most likely exist in making the home we desired an "appropriate fit" to the neighborhood.

Along with the submittal of a neighborhood plot plan indicating the approximate location of any improvement on neighboring lots and the relation to our lot to undeveloped lots, we concluded that our proposed home would be screened from the frontage road and from view of the four existing homes within the 300-foot perimeter of our property in our designated neighborhood. The requested neighborhood bulk study indicated that two of the houses in the "neighborhood" are of virtually the same gross building area or bulk as our proposed home project.

In order to further reduce apparent visible size and bulk, we adopted the Design Committee's recommendation to organize the desired spaces into a compound concept. This approach pleased the Design Committee because the overall mass of the proposal was now broken up into components and grouped around a central vestibule and courtyard. The downside to this more spread out arrangement is that this resulted in a significant increase in square footage, with the footprint appearing much larger than the neighboring homes.

While the larger compound mass also would require the removal of most of the existing trees on the property and removing some of the natural screening that might shield the home from view, in actual fact the non-indigenous pine trees on our lot were already in a diseased state and susceptible to wind-throw damage and fire. When The Sea Ranch was first chartered in the 1960s, it was planted over by the developer with stands of non-native Bishop Pine (*Pinus muricata*) and Grand Fir (*Abies grandis*), as well as Douglas Fir and Redwood, which are native and suitably adaptive.

As it turned out, the Grand Fir and Bishop Pines were particularly susceptible to wind-throw. Already senescent and damaged by beetles, most of the large pines on the site had been toppled by winds that exceeded 70 mph in November of 2003, leaving a helter-skelter pile of logs up to three-feet high in diameter and great tangles of slash. The remaining few were hazardously off-camber and in bad shape and had in fact been marked by our arborist consultant for removal. Opening up the grounds thus became the first step in stewardship and restoration, to be followed later by a vigorous planting of native species. The slash from the tree removal has been chipped on site and stockpiled for use both in erosion and silt control during construction and as protective landscape mulch during the regeneration of the native landscape to come.

The compound approach confirmed for us that added "perceived" building mass would result, in large part due to the necessity of roofed passageways and glass-enclosed walkways to interconnect the garages, home office/home theatre, and living spaces. This would also substantially increase the cost of construction. However, the implementation of using linked interior spaces allowed us to create a desired courtyard defined by the three-building compound and other outdoor spaces that enhance the aesthetics of the setting.

At this point in the process, after three denials, the Design Committee further required that we prepare a bulk analysis of the existing homes in the designated neighborhood before proceeding with further design development. The study would be necessary to determine the appropriate maximum size for the home to appear that it "fits" into the "neighborhood." This recommendation was alarming since it appeared on the surface to suggest that the size of the home would be limited by the biggest house size in the neighborhood. This was the first indication to us that we could be limited in the size of our home regardless of our personal needs and requirements. This was somewhat disheartening, given that we had no indication that this type of limitation existed when we purchased the property and began the process of designing our home. At the time of purchase, no documentation was provided, nor was a representation made by the previous owner and his real estate agent that in any way suggested the possibility of such a limitation. Moreover, this was NOT communicated to us in the previous denial letters from the Design Committee, and certainly should have been. Furthermore to a certain extent, it contradicted the original comments from the Design Committee, stated in writing in the initial review of the conceptual submittal, specifically: "This is a large house due, primarily, to the inclusion of the [home] theatre facility. This in itself is not a problem, but the formal quality of the plan and the three-dimensional form combine to give an impression of a very massive building." All told, we stumbled through the design review process and could have benefited from some clear guidance, especially from the start.

To further address the reduction of apparent size and bulk we explored methods to reduce both numerical square footage and visual bulk, which included tightening up interior spaces to be functional, not excessive. As a result, we were able to reduce the total building bulk from 5,046 to 4,304 square feet or a reduction in bulk size of 742 square feet or 14.7 percent. Overall, the lot coverage total building footprint was significantly reduced from 15.2 to 13.5 percent with total lot coverage reduced from 24.2 to 18.8 percent (well within stated Sonoma County guidelines in which the total lot coverage is not to exceed 35 percent). We also revised the roof plan to significantly reduce apparent bulk.

In the final approved design, after a three-year-plus design review period, there is no way to determine that this is a large home by simply viewing the screened southwest and northwest exterior from the frontage road, which is to the west. The

home's primary living spaces are oriented to the east, west, and south, and benefit from the penetration of the sun into and around the three-building compound. Our solution provides privacy and an inward oriented, sunny environment, with distant views of the Pacific Ocean from selective interior and exterior perspectives. The site-specific design and structures are integrated to the land and its natural context and, in terms of its relationship to existing residences, the home is so situated that the other homes in the "neighborhood" are, in fact, more exposed from the road than our proposed home, even though ours is larger.

Prior and throughout the design review process, we had assumed that the community would foster maximum individual flexibility and freedom of individual expression while maintaining the architectural quality of The Sea Ranch community and thereby uphold property values. As we understood it, that was a central premise of The Sea Ranch. As such, the Optimum Performance Home represents a different approach than that used in the design and building of other homes on The Sea Ranch. Part of this relative departure is the comprehensive inclusion of all of the techniques of sustainability and green building that have more recently been developed, especially through the impetus of the USGBC's LEED program.

Then too, our proposed green build home at The Sea Ranch has always been looked upon as a family heirloom to be passed on to younger family members. Ours would be an owner-built home and a family building project designed with the intent to serve as both a nurturing habitat and an inspiring environment for at-home creative and productive work.

Natural Environmental Factors

The single most important element in the design and construction of a home is the actual site, as the natural environmental factors dictate how your home should be designed and built and how it should be situated. In particular, the climate conditions at the site and the home's thermal response to these conditions play a critical part in the home's overall level of comfort.

Site plans are as important as home plans, especially at The Sea Ranch, which seeks to preserve the natural coastal environment. At The Sea Ranch, communing with nature is as important as community. The plans for the Optimum Performance Home embrace the desire to minimize the impact of building on the site.

Site-specific design and construction lay at the very heart of sustainability. Sustainable site design is an approach to the land, beginning with an understanding of the important natural resources of a site, the impacts of the proposed project, and a philosophy that seeks to first reduce impacts and then to mitigate impacts through better design.

The design factored in the site-specific characteristics of the nearly one-acre lot. The home is designed to optimize its relationship to the natural environment and climate, and to collect just enough passive solar radiation emanating from the southern exposures to heat the home through a cool clear winter day—yet not overheat it. The site has an approximate eight-degree western slope with a mixed woodland shelterbelt to the east, north, and west. The morning sun will warm the waking home from the east—from sunrise until late morning. As the sun moves southerly at higher midday angles, it will fully activate the solar system on the south-facing roof of the home office/home theatre portion of the home. The southern sun also will provide an infusion of bright, natural light through the solarium into the kitchen area, as will the roof-ridge skylights. And when the mid-to-late afternoon sun tries to beat on the west wall of the dining and living room, the vegetation to be planted to the west to screen the home from the road will intercept it. The effect of interaction between the microclimate and the regenerative native landscaping will be to cool the home with shade and ventilation. In addition, the design of the buildings and their orientation on the site is intended to make use of the prevailing afternoon breezes coming off the nearby Pacific Ocean.

Home Positioning

Orientation relates to the optimum positioning of the home to passively provide the natural environmental conditions necessary for daylight activities. The master bedroom suite will have French doors that will allow light in from the east as the sun rises. Another set of French doors on the west side of the suite will enable cross ventilation when both sets of doors are open. But, with the exception of a few days per year, the overall net building requirement will be for heating rather than cooling. During the day, the southern sun will provide solar gain and ambient light to the home office, kitchen, and solarium. The south-facing glazing will be incorporated specifically to reduce the home's annual heating bill. Insulated low-E glass, selective coatings, and a rigorous attention to insulation and the mass of various building materials will optimize passive solar heating and overnight thermal retention and stability.

Though part of a well-planned community, the home is also designed for privacy—from the road and from neighbors. Carrying this through to the overall design, the interior spaces are also organized to provide personal privacy when so desired.

DESIGN
optimum performance home

Placing the home to optimize privacy from the road, and yet provide the safest entrance and exit route and meet fire codes, is an important consideration. But equally important is providing for the contribution that impervious pavement makes to watershed degradation. To address this, the pervious surfacing of the driveway and garage entrance and guest parking areas, as well as the walkways around the home and grounds, are designed using pervious surfacing methods to retain all potential runoff in the immediate watershed.

During excavation, the very fertile layer of topsoil that makes up the upper foot of the soil profile will be preserved and then used for landscaping with native plants, thus preserving some of the very valuable natural capital of the land. Natural buffers in the form of native fire-adaptive redwoods, riparian uplands plants, and understory or meadow habitat bushes, flowering plants, ferns, bulbs, and trees will provide privacy and acclimatizing influences, while making use of the opportunity to flourish due to the unique hydrology of the site. A watershed management plan (See "Site Treatment") will be implemented to preserve this aspect of this particular site while protecting the actual building itself from the negative effects of too much moisture.

The landscape plan is designed to take advantage of sun, shade, and wind to make the home more comfortable, reduce heating and cooling loads, and stabilize indoor temperatures. The home's solar-integrated roof faces south to optimize electrical energy generation and complement the passive solar heating/cooling benefits derived from the home's orientation.

Site Preparation

When Marlene and I first considered the purchase of this particular vacant lot at The Sea Ranch, it appeared to be a dense, dark, overgrown lot, with evidence of large and damaged trees and thick brush. The potential was, however, quite different with the result being a sunny meadow landscape, once the invasive overgrowth was removed. The lot also favored three levels of views—controlled, local, and expansive. Controlled views look into a courtyard or a prepared place on the property, which we will maintain. Local views look out onto nearby land we either don't own or won't attempt to maintain such as adjoining properties and commons, which are maintained by The Sea Ranch Association. Expansive views go out to infinity and include the Pacific Ocean and "big sky" views. The lot is beautifully situated on the western slope of the forested coastal foothills of the coast range, with distant views of the Pacific Ocean. This potential and the otherwise favorable view perspective and gentle slope and even topography of the lot were the deciding factors in our decision to purchase the lot.

The Sea Ranch design review process entails four stages. The first is a site visit and evaluation with the property owners by a staff representative in the Department of Design Review & Environmental Management serving the Design Committee. This is followed by a review by the Design Committee of the conceptual plans, which define the character, size and bulk, and the specific relationship of the home to the site and to the other homes in the designated "neighborhood." The determining stage is the review of preliminary design, which details all of the elements approved by the Design Committee in the conceptual stage. Once the preliminary plan has been approved, the final stage is the construction plan review and approval. This stage details how the home will be constructed in accordance with the approved preliminary plan. Following Design Committee approval, the set of construction plans must be approved by the Sonoma County building department before a permit to build will be issued.

Over the course of a two-and-one-half-year period we had six denials before our preliminary plan was approved in June 2005. Our construction plans were approved by the Design Committee in January 2006 with the stipulation of certain design modifications and approved landscaping. We are now in the plan check and approval phase required by Sonoma County, prior to the issuance of a building permit. We expect to break ground in March with the installation of the French drain system and grading of the building pad to accommodate the foundations.

During the fourth conceptual plan review submittal prior to the preliminary review submittal, the Design Committee required us to retain an arborist, a professional tree and forestry expert. We retained arborist Ed Tunheim, who prepared a full report on the status and health of the trees on our lot. The report confirmed our earliest assessment of the deteriorating condition of the trees at the site—virtually all of the trees were diseased or hazardous and required removal, including those that otherwise would have to be cleared to accommodate our project.

At this same time, the Design Committee expanded the geographical size of the declared wind-throw danger area that abutted our property to formally include our lot. A wind-throw danger area is an area in which shallow-rooted trees, such as pines, are subjected to

The series of images depict the various stages of site preparation from the raw state at the time of purchase to the initial felling of trees.

severe wind damage, including toppling and are recognized as a potential hazard to surrounding improvements and people, and a fuel to spread fire.

While our arborist's report identified numerous diseased and hazardous trees to be removed, including trees endangering the regional power lines occupying an easement on the north side of our property, no immediate action granting hazardous tree removal was taken by the Design Committee. Unfortunately, in late December 2004, one of our trees took out the power lines, resulting in a power failure on much of The Sea Ranch and south coast over an 11-hour period. As a result, the power company took action and felled several marked trees that remained a hazard to their lines. A month later the Design Committee granted our application for hazardous tree removal, which was previously denied on the basis that arborist reports are typically reviewed in concert with the preliminary stage building stakeout and permission to remove issued at the time of a secured construction permit.

At this point, we retained John Eaton, a general engineering contractor based in the area, to fell the remaining tagged trees and dense brush identified in the arborist's report. A few trees remained that were tagged but we have decided to fell them nearer the time the lot would be graded and prepared for putting in the foundations. Several native myrtles and madrone were carefully preserved during the tree and brush removals.

As our lot is now officially part of The Sea Ranch declared wind-throw danger area, we have become subject to a neighborhood revegetation program. We have complied with the recommendations for planting indigenous plants native to our "zone" as prescribed in the Neighborhood Landscape Management Plan and will commence planting soon.

A requirement of building a new home is an analysis of the soil conditions that will impact the type of foundation necessary, determine the presence or absence of ground water, and, if there is no sewer connection to the property, the site's suitability for a septic system.

In the case of our lot, the soils analysis performed by Dimensions 4 Engineering, based in Santa Rosa, California, indicated that, while we had suitable soil structure, the presence of perched ground water five to six feet below grade would not support an on-site septic system. Thus, The Sea Ranch Department of Compliance &

Following the felling of trees and cutting of brush, the debris was then burned and the senescent and damaged pines that were cleared were stockpiled at the site to be chipped, so no bare ground will be left exposed after construction.

Environmental Management granted us a reservation for the use of a portion of The Sea Ranch commons for the location of our proposed off-site septic system's leach field. This would mean that the home itself would be served by a water-tight septic tank to remove solids and digest them over an extended period of time, but that the clarified effluent instead of flowing to an adjacent leach field, would have to be pumped offsite to a site on The Sea Ranch commons.

Next, we retained BACE Geotechnical, based in Windsor, California, to perform the soils analysis and geotechnical engineering services to determine the soil's structural capabilities, and determined that the soil could support standard concrete slab foundations. This information was also used to prepare the site grading and water management plans.

Bill Wilson, who is a principal Environmental Planning & Design, LLC, based in Mill Valley, California was retained as our site development and water management planner. UHD

The Author

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Acknowledgements

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The First Optimum Performance Home™
site treatment

Bill Wilson

Synopsis

- *The hyrologic plan intercepts the water that moves across the site, transfers it around the house, and returns it, through infiltration chambers, to the natural hydrology in front of the house, using a pond as a stabilization feature on the whole system.*

The site for the Ultimate Performance Home at The Sea Ranch is a gently sloping property with an open west and southwest exposure. At the time that the roads were put in by the original developers of The Sea Ranch in the 1960s, shallow-rooted non-native pines were inappropriately planted over major areas, including over this site. Over the ensuing 40 years, the trees have matured and become quite large. Then, during November of 2003, unusually heavy winds, with gusts over 90 miles per hour, swept through and knocked down hundreds of trees, including ones on this site. The site is now part of a declared wind-throw danger area, which encompasses several adjoining properties, all impacted.

As a result, many major trees at the site were marked by the regional arborist and taken out, and the underbrush was cleared in the process. The following rainy season began with above average levels of precipitation in October of 2004, and followed up with over 45 inches of rain, with consistent events stretching into June of 2005. Because of this, field observations and geotechnical borings were able to develop a good picture of the site's hydrology.

Particularly poignant was the large root crater left when a three-foot diameter pine toppled over. (Even though it was not raining at the time, the hole filed with water, and remained full until the tree was cleared and the "divot" filled.)

In addition to the shallow groundwater that was indicated by the tree crater, there was also sheet flow taking place along the southern property line, an open, well-vegetated meadow at the edge of a thicket of willows that backed up the property. The sheet flow of infiltrating water originates on the property adjacent to the project property to the south, and crosses onto the project property.

The environmental and geological investigation confirmed that a thin sheet of groundwater was present at the interface boundary between the terrace soils and the bedrock siltstone underlying the site, about five feet below grade across the planned home site. A curtain drain was recommended to intercept the groundwater and pipe it around the location of the home.

Instead, an analysis of the grading plan for the house pad and of the hydrology of the entire site was made, and a plan evolved that will protect the actual building site and foundations but maintain the unique watershed characteristics of the seasonally marshy meadow.

A hyrologic plan has been developed to intercept the water that moves across the site, transfer it around the house, and return it, through infiltration chambers, to the natural hydrology in front of the house, using a pond as a stabilization feature on the whole system. This should effectively address the movement of water from the neighboring property across the site, providing a dry pad, while at the same time maintaining the existing natural hydrology.

Following the environmental assessment of the lot and surrounding area, and the geological investigation, and in concurrence with the project geologist, it was decided that due to the hydrological regime of the site it would be extremely challenging to construct an earth-banked building and insure that it would remain dry and sound over time.

Instead, a sloped bank to the rear of the house will not be retained or faced in any sort of formal way, but will rather be incorporated into the landscape plan and intermittently spotted with natural boulders. Native ferns, rhododendrons, and bulbs will be planted in between the "randomly" placed rocks. Because of the moisture in the area, this should produce a lush natural transition from the house pad to the natural landscape behind the house.

The grading and drainage plan is integrated with the landscaping plan to take advantage of the site's lush potential to serve as a repository for plants that thrive with more moisture, and to enhance habitat values. An excavated pond was also designed to intercept and manage the sheet flow and possible spring that crosses onto the back of the property from the neighboring lot.

Some of the features of the integrated site plan include:

• **There will be an excavated pond at the rear of the property, with a volume of approximately 50,000 gallons.** The pond can be constructed completely by excavation and does not require a berm or constructed dam. The four- to six-foot deep 45-foot basin will be over-excavated by about a foot, and sealed by Seepage Control. The Seepage Control system utilizes a vegetable-derived polymer mixed with a foot of soil to seal the pond. This is more effective than a liner in many applications. Thus, the polymer will be mixed with the native soil and compacted to form a foot-thick natural impermeable soil liner. The pond will then be filled and landscaped with important and interesting native plants, including rushes and reeds, bulbs, and aquatic plants.

• **A horizontal drain made up of strips of a unique drainage product, Smart Drain will be installed above the pond to wick the sheet flow from the adjacent lots into the pond.** Smart Drain is a versatile product consisting of thin strips of plastic pipettes that create capillary draw and remove excess moisture, while leaving non-saturated soils with the moisture needed to support plant life and soil ecology. The horizontal drain will act as a virtual spring box to recharge the pond.

• **A level control adjustable weir device will allow excess water coming into the pond to overflow.** The water being discharged will actually be drawn through a bank of infiltration chambers buried in gravel on the bottom of the pond. This design keeps aquatic life from being discharged, and tends to pull oxygen down through the water column. The excess water will be conveyed by a buried pipe to a chamber in front of the home, dubbed the "water handler," which will manage excess flows from the foundation drains and from the roof catchment cistern as well as from the pond.

• **All drainage systems require an overland flow route in case installed drains and pipes become blocked, and a shallow vegetated bioswale already exists along the southern property line.** The only problem with it is that it veers into the actual area that will contain the house pad as it approaches the lower front of the property. To correct this, an existing vegetated swale is to be adapted to continue down the sideline and fan out along the frontage. This will require no changes or grading on the neighboring property to the south of the project property.

• **A gravel beach is a feature of the southern side of the pond, adjacent to the swale.** This will serve as an overflow filter and spillway for the pond should the level control slider box become blocked for any reason. By depressing the gravel beach a few inches below the lip of the pond, and carrying it out to the swale shoulder, excess water will actually bypass the pond when it is full, should the weir become blocked.

To reforest the site and replace the downed pines, a semicircle of redwoods is planned for the northeast corner of the lot. Redwoods are the appropriate native overstory, as they are deep-rooted and fire-adapted. In addition, they can take up significant amounts of excess soil water and act as a sort of curtain drain above the pond, helping to mitigate the perched groundwater. Additional screening trees and bushes are planned for the area along the power line right-of-way to the north of the house site.

• **Because it is anticipated that the pond will actually receive a surplus of water from the various inputs, the pond will also serve as a reservoir for the landscaping around the finished home.** A one-foot draw down of the pond will yield approximately 12,000 gallons, or about enough water to irrigate a quarter of an acre of turf for a week. The native landscape planned for the project will require significantly less.

• **The pond will also serve as an emergency water source in the event of a fire.** A draw down pipe will connect the pond water to a front-of-house connection for a pump to provide pond water to a fire hose.

• **An analysis of the elevation of the bedrock (and hence the perched groundwater) showed that the grade cut for the house pad would actually intersect with the bedrock at the rear of the structure.** Aside from greatly reducing the cost of the rear footing, this meant that the deep curtain drain anticipated by the geotechnical report could be substituted with a shallow French drain and foundation drains.

• **The French drain is designed to be cut a minimum of one foot into the bedrock and to wrap around the rear of the house pad.** A slotted drain pipe is to be placed low in the drain trench and will pick up any groundwater that is migrating along the bedrock boundary. The slotted drain pipe will continue into a solid drain pipe and terminate in the "water handler" basin in front of the home.

• **Roof runoff will be harvested by rain gutters over most of the eaves and valleys, and directed into a cistern placed beneath the central courtyard.** After passing through sorbent filters to remove any sediment and impurities, the clear rainwater will be

stored to provide natural soft water to the outdoor showers, heated by a demand-type tankless water heater. Overflow from the cistern will also go to the "water handler," via a drainage pipe.

• Instead of constructing retaining walls to accommodate the grade changes brought on by the pad cut, a sloping side cut returning up to the natural grade was chosen. The side-cut will be landscaped with boulders and rock in a naturalistic layout and densely planted with ferns, begonias, and rhododendrons, with a variety of the more moisture-loving natives and bulbs.

• The "water handler" is designed for the front of the property to act as a distribution basin for all of the various inputs of excess site water, and to reintegrate it back to the native hydrology. The "water handler" consists of a 30-inch diameter ribbed section of PVC storm pipe, with a sealed bottom and a bolted, gasketed lid, buried vertically and plumbed with influent lines from the pond level control weir, the French drain, and the overflow from the cistern. A pump and control system will send drainage water from the French drain up to the pond to replenish the pond water level during dry periods, as necessary, and to top up the water features at the front and back of the home. The water handler also includes an overflow line that leads to a band of infiltration chambers that will be buried across the entire frontage of the property.

• A line of infiltration chambers is designed for the lot's frontage. The infiltration band is designed as a trench with half-domed StormTech chambers buried in gravel and a foot of native soil. The trench bottom will be dead level, across the front of the property, with the intention that even large amounts of wet season runoff and groundwater that have been interrupted by the insertion of a house can be returned to the groundwater once past the house.

• In case the volume capacity of the infiltration band is exceeded, a second set of chambers is designed for the lowermost corner of the lot (the northwest), several feet lower in elevation than the main infiltration belt. This shorter set, though installed the same way as the upper band, will receive any excess water via an overflow pipe and either infiltrate it or, if no further capacity exists, exfiltrate it along the topography line, where it will sheet-flow through mulch and groundcovers and rejoin the natural drainage.

Permaculture Regenerative Planting

Other integrated elements of the drainage and landscaping system include a permaculture regenerative planting of the property, featuring an overstory of redwoods on the northeast side of the lot, a middle story with screens of madrone, wax myrtle, dogwood, and California bay laurel, an understory of rhododendrons, azaleas, ferns, and flowering shrubs that support birds and butterflies, and groundcovers of mimulus and pennyroyal.

The senescent and damaged pines that were cleared were stockpiled at the site to be chipped, so no bare ground will be left exposed after construction, and the mulch can also be used as a temporary site control during construction to prevent the discharge of sediment. Native grasses and groundcovers, as well as at least four varieties of ferns found at the site, are being collected and propagated for reintroduction after construction.

To minimize the use of increasingly valuable potable water, no landscape will be irrigated with imported water. The plumbing system and fixtures planned for the home are being carefully selected, and it is anticipated that water consumption will be reduced by at least 40 percent, compared to comparable fixture selections that comply with the benchmark EPACT '92 designations for toilets, showers, and baths.

Septic System

The Sea Ranch, for the most part, uses individual septic systems to handle wastewater. Though frequently maligned as a primitive and even polluting wastewater treatment method, a properly designed and installed septic system is actually an effective method for treating sewage if certain parameters are met. The tank itself must be absolutely water-tight, though in actuality few tanks installed more than a few years ago actually were, and all too many currently being installed either leak or take in groundwater. The tank must also be an effective size and shape—generally, length is important, since travel distance from inlet to outlet has the greatest effect on effluent quality. The effluent pipe should also be equipped with a device known as an effluent filter, which blocks fine particles from leaving the tank. And finally, the tank should have accessible access ports to the surface that are also water-tight, to allow for inspection and maintenance.

If these basic design criteria are met, it is possible to get a clear water effluent from a septic tank that approaches the discharge quality of many municipal wastewater treatment facilities. This water is then conveyed to the leach field, where soil and soil organisms complete the polishing of the effluent and return it to the environment. Under the best of circumstances, the water is available to trees and plant root systems.

Since this lot has shallow groundwater, the septic tank effluent will have to be pumped to a commons and the leach field installed there. This allows for the installation of a programmable timer on the pump controls and the gradual draw-down of a day's effluent in small doses. By intermittently dosing the leach field in this manner, small volumes of effluent can be sent to the leach field and be allowed to dissipate by capillary action, with resting periods between doses. This method optimizes the ability of soil systems to polish septic tank effluent.

Gray Water System

Because of the shallow groundwater, and the seeming availability of sufficient site water to maintain the landscape, a gray water system may be superfluous. Nonetheless, the home will be plumbed for gray water, bringing the waste lines from the laundry, sinks, showers, and baths to the building perimeter in parallel with the waste line from the toilets and kitchen. Once outside the building foundation, the two waste lines can be tied together and directed into the septic tank. Should gray water be needed for additional landscape irrigation, such as during a severe drought, it will be accessible.

Invisible Structures GravelPave2

As discussed earlier, using pervious paving as a substitute for runoff-producing concrete and asphalt is one of the ways to limit the hydrological footprint of a project. To provide a stable and load-rated entry drive, Invisible Structures GravelPave2 was selected. It will also be used to reinforce the paths around the home and grounds to support wheelchairs, in keeping with the attention to accessibility that is a focus of the overall design.

Invisible Structures ring-grid system of geotechnical reinforcement is capable of supporting loads much greater than those anticipated for the entry drive, and once installed over open void drain rock, will allow rainfall to pass through without restriction. Other than the roof, there will essentially be no hydrologically effective surface area over the rest of the project, although technically a full pond would have to be considered as an "impervious surface."

Summary

To summarize, the challenge in designing a construction project on this particular site has been to accommodate the requirements of the building plan, while maintaining the unique environmental quality of what can be, due to a number of offsite influences and a fairly wet slope. It is hoped that the resulting design will allow a very special home to be seamlessly inserted onto the site. Though necessarily interrupting the flow of water as it has existed prior to development, and using the pond as a "flywheel" for excess flow across the site, the intercepted drainage can actually be guided around the planned home and returned to the natural watershed. No additional runoff will be generated. In this way, the advent of a dwelling on the site will bring with it both a low impact and an added element of stewardship and enhanced habitat values. UHD

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The Architect's Role As Designer And Implementer

Gary Reber

Synopsis

- *A home should express the way you actually live and use space efficiently so that the money you have to spend is used in the best way possible to build quality, beauty, and day-to-day operational efficiency.*
- *A true custom design approach to a new home project is preferable if you want to optimize the spaces and design features that will best reflect you, your values, and the lifestyle you embrace.*
- *Knowing what you want is one of the most challenging aspects of designing and building a new home or remodeling an existing home.*
- *There are three variables that prospective homeowners will have to contend with in designing a new or remodeled home—quality, size, and cost.*
- *Wisely choose an architect or architectural designer to work with you in designing your dream home.*

Preface

While the focus of this article is on the role of the architect or architectural designer as a home design implementer, the most challenging work is the preparation prior to retaining an architect or architectural designer and their support team. Much thought, analysis, and research is necessary to become prepared to address the many intricacies that make up home design.

This article will first address your lifestyle requirements, as this is what a home should nurture. Defining real living spaces will help you to decide on the actual square footage you require to sustain your lifestyle.

Knowing what you want in your new home is critical in determining the level of quality and the amount of space you need. You will be challenged with carefully aligning your dreams with the realities of your budget.

The place where you will save the most money and make the greatest difference is in the planning and design phase of your project.

Finally, after an exhaustive exercise in preparation, you will be ready to interview prospective architects and architectural designers and form your design and build team. In addition to the selection of your architect or architectural designer, you will require other professionals during the design and build process. Always remember that nobody is master of ALL the skills necessary to build a modern house and a team approach is desired to assure success.

Know Your Lifestyle

A home should be a place that nurtures your lifestyle. Thus, it is paramount that you can define your lifestyle in terms of the spaces that you need to truly end up with a home that works for you.

A home should be a place that comforts and inspires you to be creative and productive, so as to enrich and sustain your lifestyle. A home should express the way you actually live and use space efficiently so that the money you have to spend is used in the best way possible to build quality, beauty, and day-to-day operational efficiency. A home should be scaled to human proportions yet have some unexpected surprises. To design smart is to not waste money and resources on square footage that you won't use but instead make the home an expression of you, your values, and the lifestyle you embrace. Thus, a home should have sufficient space to nurture your lifestyle but not be excessively large.

Designing and building a home or remodeling a home is not a simple task. It entails knowing your aspirations and needs, as well as the realities of the money you have to fulfill your dreams. The ensuing process is a struggle, and you will constantly be faced with the challenge of managing your dreams with the reality of a budget. Then, too, there is the emotional weight caused with having to reconcile differences of opinion in the different design features desired by a husband, wife, and family members, or different features desired by the man and woman in the household. This is one of the most challenging aspects of designing and building a new home or remodeling an existing one. Therefore, a lot of time, consideration, and compromise is required to understand and define the features individual members of the household want in order to achieve an end result that all will appreciate throughout their lives.

Your home should be designed to have both expansive social spaces and cozy private ones. Such a home should express the special craftsman details desired by its occupants. It should reflect the way people really live and respond to their personal needs and requirements as an expression of the lifestyle they embrace, and serve to sustain independent living and aging-in-place.

Too often, people designing and building homes end up with empty square footage that lacks human scale and feel. We are all familiar with the vastness of row after row of enormous people-storage structures densely packed onto the landscape. Such are the typical new large subdivision homes. Such homes are formula homes—box structures that require their occupants to adapt to preconceived and defined rooms that are unused instead of a home designed with adaptable spaces to accommodate the various activities that the occupants engage in on a daily basis. Instead of the traditional formal rooms defined as living, dining, kitchen, and family, an increasingly more favorable approach is to design the "living" area of the home to encompass family, living, kitchen, and dining functions—all efficiently interconnected and visibly open to each other. Varying the ceiling height in parts of this area is useful to define various spaces, yet retain the feeling that each space is part of the whole.

Other important considerations are that the home is connected to the outdoors through transition spaces such as porches, decks, patios, and sunrooms or solariums. Living should flow in and out of doors with the two linked together through landscaping. New homes designed for expansive lots can often support a compound of structures, each with indoor and outdoor living spaces. Fences, vegetative screening, trellises, gardens, courtyards, patios, and decks define outdoor space just as walls and ceilings do indoors. Climate will determine if your compound layout needs to all be connected and protected from adverse weather.

Universal Design

While it is commonplace when you are young, healthy, and fit to not think about getting older and remaining in your home, sooner or later the realities of aging will challenge every adult. Not only is there increasingly limited mobility that results from aging, but there is a host of other stress-related factors to which the typical home design contributes. The home building industry has inadequately addressed the idea of designing age-friendly homes, yet there are now more people in our country over the age of 55 than there are younger. An aging population will soon be challenged with how to deal with designing homes that allow people to age-in-place and optimize independent living.

A sensible approach is to design your home in which all everyday living functions are on one level. Should you build a second story, reserve that space as bedroom quarters for guests or visiting family, or provide elevator access.

> **"Most often prospective homeowners find it difficult to express what they want that best reflects their true lifestyle and values."**

Wherever possible, avoid any physical barriers in the design such as steps and stairs, humps and bumps, and reduce stressful bending and lifting. This applies to the design of all living spaces in the home, including kitchens and the positioning of appliances, and bathrooms and the fixtures for bathing, showering, and personal grooming. The key is to think in terms of how the plan and the spaces—and fixtures that support day-to-day living—will enhance livability as you get older.

True Custom Design Or Builder Plan Portfolio

A true custom design approach to a new home project is preferable if you want to optimize the spaces and design features

that will best reflect you, your values, and the lifestyle you embrace. Often is the case in which a builder owns a development of so-called custom home sites and offers, as a condition of purchasing a lot, a portfolio of plans to choose from. Often a builder will offer a degree of "customization" to the stock set of plans, but rarely an opportunity for input into the design. Unlike a true custom home design process, the builder portfolio approach does not provide the degree of homeowner input into the size of spaces, room relationships, and craftsman detail that are the prime aspects of customizing home design to the clients who will occupy the finished structure. Too often the stock plans, when actually constructed, result in an impersonal, oversized house that does not reflect the desired personality of the new occupants.

Still another option is to select a plan from a portfolio of stock plans offered by various companies. As with the builder plan portfolio option, there is limited opportunity for true customization. You purchase the set of construction plans and have your contractor build the home on your site.

Finally there is the option of purchasing a pre-fabricated home, which is shipped to your site. The home comes as a kit to be assembled on your lot. Several companies offer this option and provide a degree of spatial tailoring according to your requirements, but you are limited by the overall size dimensions of the particular model you choose.

The custom design and build option requires due diligence in the purchase of the property on which you build. You will need to ensure that you have full-access rights and that any limitations or restrictions conditioned in the purchase and use of the property, especially applicable design rules, are acceptable to you. If you can condition the purchase of the property on such acceptability, don't hesitate to do so. You'll also want to ensure that you approve of the views; soil under and around the house; access to the property; sunlight potential during the winter season; weather protection from the elements; pollution from noise, light, and smells; expandability for future structures, gardens, pools, ponds, and landscaping; site slope for natural drainage; water harvesting features and waste system options; and future parcel development potential.

Of course, the cost of land and construction are always barriers to achieving the end result you desire. Often people will want a home that is several times more expensive than they can afford. Thus, it is important to first understand the hard facts about the costs of building a home in the area you want to live. While a true custom design and build project can cost significantly more than the track home or builder portfolio options, building from scratch can be on par or even less costly if you plan intelligently. But for most prospective homeowners desiring to build from scratch, two main questions to consider are: 1) How can we do it so that the end result reflects our lifestyle? 2) How will we reconcile our dreams with the realities of what we can afford?

Know What You Want

As previously noted, knowing what you want is one of the most challenging aspects of designing and building a new home or remodeling an existing one. Most often prospective homeowners find it difficult to express what they want that reflects their true lifestyle and values.

Probably the key consideration in designing spaces is the degree of comfort derived from occupying the individual spaces that define a home. Simply building rooms and spaces that reflect size and bulk is no substitute to designing for comfort and spatial quality. Always think about the quality of the spaces you will be occupying in your day-to-day life in your home. In addition to the functionality of the floor plan, give equal time to the build-quality and detail of the spaces in your new home or remodel. What I mean by build-quality and detail on the exterior of the home is the siding and roofing textures and hues; window and door design, including finely crafted moldings; and pavement texture and landscaping. Interior details pertain to flooring surfaces, wall and ceiling textures, window fixtures, staircases, crafted built-ins, counter and cabinet design, kitchen appliances and bath fixtures, and color throughout. Always seek the highest level of detail that your budget can support. Saving money on excessive space, that will in reality not be used or not used enough to be without, will allow you to budget for a higher level of detail. When you think about it, a home without attention paid to detail does not convey the feeling of comfort. Simply put, more space than what your personal needs and requirements of your lifestyle dictate does not equal more comfort.

What is important is that in designing and building a new home or remodeling an existing home you carefully evaluate what really makes you feel comfortable. Put the emphasis on desirable and comfortable spaces, rather than on sheer size and volume. This formula will result in different sizes of homes, depending on the lifestyle requirements of different occupants —from small to large, and from modest to very expensive. While simply building a very large home may seem to be desirable, in actuality, you may find that building a smaller home that optimizes your lifestyle will work better for you and require less space than you thought you needed or wanted. The efficient use of space, which otherwise represents a substantial amount of space that is rarely used, is not only far more practical from a building cost and operational standpoint but also allows you to budget expenditures for architectural detail

with distinguishable character and charm that you will far more appreciate.

How you get to realize your true lifestyle and values to be reflected in your home requires an analysis of the lives of the home's occupants at all stages of life. Unfortunately, the vast majority of homes and the current pattern of track home offerings have never been designed to optimize sustainable lifestyles. Smart homeowners will want to ensure that whomever occupies the home they build can function without encountering stressful physical barriers, support all occupant ages and abilities, and maximize independent living for aging-in-place.

To be successful at age-friendly home design requires considerable thought and planning. It requires a commitment to participate in the design process with your architect or architectural designer and interior designer and the other professional members of your team. This process of participation is the only way that you will end up with a result that is an expression of your personality, values, and the lifestyle you embrace, and that will serve to enhance your life.

Space Proportions

So often large custom homes suffer from poor proportions of space—the relationship of the vertical to the horizontal dimensions and to the dimension of depth. Spaces should be pleasingly proportioned and embrace a human scale that is inviting to experience. Avoid overscaled spaces, which don't feel comfortable. Think about delineating smaller, human-scaled spaces within rooms to support various functions. An ageless example is the window seat, which is human-scaled for one or two people to sit in or to sleep on and can be uniquely designed in numerous styles tucked into the spatial dimensions of a home.

Think in terms of "tailoring" by listing the features you want in your home. This list of features will become the criteria that your architect or architectural designer and/or interior designer will use to work with you in designing your home so that it ends up being tailored to the way you live, with spaces and architectural detail that is gratifying to you.

Research is the foundation of knowing what you want in terms of spaces and architectural detail. Explore books on architectural home design, subscribe to magazines related to home and interior design in addition to *Ultimate Home Design*, visit model homes, and compile examples of the spaces and architectural detail that you like. This portfolio of options will become extremely important to you when working with an architect or architectural designer, or interior designer, in crafting your future home. Arrange your portfolio according to the spaces you desire in your home that reflect the day-to-day activities of your life.

Reconciling Dreams With Realities

There are three variables that prospective homeowners will have to contend with in designing a new home or a remodel—quality, size, and cost. Each variable impacts the others and determines the end result that becomes the reality of your project. Your budget will determine the scope and sequence of the project.

Part of the fixed cost is the amount of money required to purchase the site of your new home and the expense entailed in site-specific preparation and construction. Size is a variable that allows significant cost savings if you design to optimize space and efficiency. Quality is the other variable that significantly

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impacts the cost of the project. The more quality associated with the workmanship, materials, and details of the home, the more expensive the project. Typically, cost is the fixed variable, as this reflects the site and how much house one can afford. That leaves quality and size as the two variables to address in the design and building of your home.

Working through these variables is an exercise in reality planning. An architect or architectural designer can be an excellent resource to guide you through this process. It is imperative that the approach you engage in with your team is one in which all three variables are understood and that each member of your team remains flexible in their approach to the design and building of the home.

Making "wants" and "must-have" lists of what elements you desire in your new home is an important exercise to help discipline you in reconciling these three variables. The "wants" list identifies all of the elements you would like to have in your home without regard to budget. Use the ideas you have researched in books and magazines and from other sources to create this list. Upon completion, identify the "must-have" elements. The best approach is to define the elements in terms of the home's exterior and its interior spaces that you desire for everyday living. The more specific you are, the better the design can reflect your needs and requirements.

As part of this exercise, you should pay particular attention to sustainability—the responsible use of sustainable and renewable materials in the actual building of the home. There are numerous cost-effective and competitive sustainable building materials that don't squander the earth's resources. The new LEED® (Leadership in Energy and Environmental Design) for Homes pilot program of the U.S. Green Building Council is an exemplary set of design guidelines that will help you to build a new home or remodel an existing home while embracing sustainability and using renewable/recycled materials.

Along with sustainability is energy efficiency. Energy-efficient construction entails a tighter building envelope using lots of insulation, quality windows, and a tighter air barrier. As a result, such homes can ensure healthier indoor air quality. An energy-efficient home saves money because the design optimizes the use of the energy required to heat and cool it and requires a lower amount of energy to operate.

This exercise should be done long before you actually proceed to the conceptual home design phase. The more research you do on your own, the more you will be able to communicate effectively with your eventual design team. Each of these lists will prove invaluable to the architect or architectural designer you retain to incorporate all of the desirable elements into the plan.

Deciding On An Architect Or Architectural Designer

Now that we have covered the necessary background understanding for approaching the design of your custom home or remodeling project, the next step is to wisely choose an architect or architectural designer to work with you in designing your dream home.

Preparation is your best resource. Every custom home design project is unique with particular opportunities and challenges. A design project can take from a year to three years or more, depending on the circumstances. One such factor is the extent of regulatory agency oversight that the project must pass through to be issued a final building permit.

Before engaging an architect or architectural designer, it is wise to rely on your own resources and time to do the necessary research that will help you to define your "wants" and "must-have" elements that complement your lifestyle. Review the site options you have with respect to the soil, slope, and drainage conditions and choose the site that is best for development. Comprehend the design constraints and requirements that can be imposed and be able to accept another authority(s) dictating those constraints and requirements. Familiarize yourself with space arrangements based on your research. Research material costs and the costs associated with various building science approaches. While a green build approach may initially cost more money than conventional construction and approaches, long term you may be able to achieve a zero energy cost home operation that will more than compensate for the initial cost outlay. In other words, familiarize yourself with the conditions and circumstances that can impact the time and cost to design and build.

The Sea Ranch Case Study

As a case study example, in the pages of *Ultimate Home Design*, a series on the design and building of the first Optimum Performance Home™ at The Sea Ranch, California, is being published. "Optimum Performance Home" is a term I use to describe a home design that meets the requirements of aging-in-place while respecting to the fullest extent, sustainability and environmentally enhanced life-span living. It embraces the "Ultimate Home Design" concept, which recognizes, respects, values, and attempts to accommodate the broadest possible spectrum of human abilities, regardless of age, ability, or physical stature, in the ergonomic design of products and environments that are easier to use and more aesthetically appealing, while optimally integrating sustainable

green building practices and minimizing the overall impact on the natural environment.

This project is now in the third year of design, with construction to commence in March or April 2006. Of course, The Sea Ranch is a unique community, incorporated as a Common Interest Development and governed by The Sea Ranch Declaration of Restrictions, Covenants and Conditions (CC&Rs), which contain design criteria and rules interpreted by a Design Committee appointed by the elected Board of Directors of The Sea Ranch Association.

The Design Committee is vested with the power to approve or deny house and landscape plans. The Design Committee is composed of three members, with alternates, in case a member(s) cannot be present at a design review meeting. Currently there is a pool of four architects and two landscape architects that serve on the Design Committee in three-member sessions. During the design review process, property owners are not assured that the same three Design Committee members will be present at each review stage. Thus, there are up to 15 possible combinations of two members and up to 20 possible combinations of three members for any given Design Committee session that can determine the outcome of any design stage. Such has meant that differing opinions have caused various revisions to the design over time, and at no time has the Design Committee been consistent in its actions because of the inconsistent requirements of the shifting composition of the group.

This is one of those worst-case scenarios that, hopefully, you won't have to deal with, but it presented a difficult situation for our project due to the inconsistency that the arrangement produces. As well, our project was far more leading-edge than previous home design projects at The Sea Ranch and required the Design Committee to view certain aspects of the design with new thinking.

There are four stages in the design review process. The first is a site visit and evaluation with the property owners by a staff representative in the Department of Design Review & Environmental Management serving the Design Committee. This is followed by a review by the Design Committee of the conceptual plans, which define the character, size and bulk, and the specific relationship of the home to the site and to the other homes in the designated neighborhood. The determining stage is the review of preliminary design, which details all of the elements approved by the Design Committee in the conceptual stage.

Throughout the design process, the Design Committee does not welcome meetings with the property owner or his or her representative(s). Writen communication is the means in which documentation is recorded. In the event of a rare meeting, the meeting is voice recorded.

Once the preliminary plan has been approved, the final stage is the construction plan review and approval. This stage details how the home will be constructed in accordance with the approved preliminary plan. Even at this stage the Design Committee can require further revisions. Following Design Committee approval, the set of construction plans must be approved by the county building department before a permit to build will be issued.

Depending on the conceptual approach and the complexity of the project, as well as numerous other possible factors, this process could and has taken years to complete. Your circumstances could be similar, depending on where and under what agency

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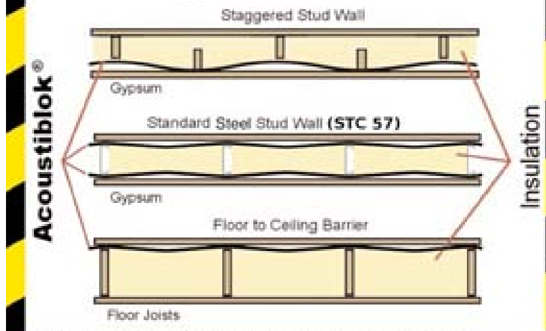

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jurisdiction your project is subject to review and approval from. Or the process could be very much simplified and uncomplicated with far less jurisdictional red tape. In any case, you need to be prepared for whatever your circumstances are and plan your time and resources accordingly.

In the case of the Optimum Performance Home project that my wife Marlene and I are engaged in, our first architect resigned after three conceptual plan denials. At that time I took over as the "architectural designer" on the project and was denied twice more. Finally, the staff of the Design Committee recommended an architectural designer that has worked successfully on numerous projects at The Sea Ranch. On their recommendation, we went with the architectural designer rather than an architect to help us refine the design and secure the approval of the Design Committee. The conceptual plan was approved on the sixth submittal, and the preliminary plan was approved with a condition that a section of the home be modified according to Design Committee wishes. The final construction plans were approved in January 2006. with the stipulation of certain design modifications and approved landscaping. We are now in the plan check and approval phase required by Sonoma County, prior to the issuance of a building permit. We expect to break ground in March.

An Architect Or An Architectural Designer

As for the difference between architects and architectural designers, it falls mainly on the type of license (if required) under which they are practicing and the type of projects they can design. State laws vary regarding the type and size of buildings architectural designers may work on. For home design, the difference is essentially transparent. A professional approach to any project should be based on the aesthetic, functional, and economic solutions that will best fulfill the client's design program while also relating pleasingly to the site and the environment. Often architects and architectural designers will have equivalent education, training, and experience. In some cases, an architectural designer may have more practical knowledge. In many states (e.g. California) both professionals will rely on a licensed structural engineer to verify that the home is structurally sound and meets the requirements of the local building codes.

Now, if you don't know a reputable architect or architectural designer, you should ask for recommendations from friends, relatives, and colleagues who have worked with an architect or architectural designer, and have had a successful and rewarding experience. One excellent resource is the American Institute of Building Design (AIBD) at www.aibd.org. This organization can provide referral lists based on geographical area. Their members must abide by a code of ethics and strict requirements for membership. Another avenue is to contact the American Institute of Architects (AIA) at www.aiaonline.com. This site provides information on finding and working with an architect, with a list of 25 questions to ask when interviewing candidates. The AIA's database can be searched by geographical area as well. You may also find media that local architects and architectural designers advertise in. Most likely these architects and architectural designers work in the immediate area where you intend to build your home. It can be advantageous to retain a local architect or architectural designer because they are likely to have more experience with design and construction particulars in your site's area (such as places like The Sea Ranch that have specific and strict design rules).

Interview several prospects and isolate those who have won your confidence and show qualities of commitment, experience, and expertise. During the interview, the architect or architectural designer should describe his or her philosophy of design, the method of work, and, where applicable, areas of specialization. Ask for a list of former clients and recent projects. Arrange to look at the portfolios of the architects and architectural designers you believe could be suited to your project to determine the quality of their design work. During this process, you will surely realize the unique contribution an architect or architectural designer makes to the creation of architecture. An architect or architectural designer should have a broad knowledge of design and construction, and he or she should be able to work through your ideas from beginning to end, analyzing costs and completion time. You want an architect or architectural designer to understand your requirements, and build upon them.

Most important will be the working relationship you and your architect or architectural designer have. It is important that you select an architect or architectural designer with whom you feel both compatible and comfortable, and with whom you are able to communicate. The architect or architectural designer will be the person you entrust with your dreams and your money, and a good working relationship is essential to the success of your home design project. You'll see a lot of each other and converse often regarding space layout and details, sometimes under trying circumstances. You'll want to determine that this person can handle the inevitable misunderstandings and disagreements in a professional manner, and work well under pressure.

Discuss the architect's or architectural designer's fee. Inquire as to what methods he or she uses to monitor costs and schedules. While there is no exact formula to arrive at the

total price associated with architectural fees, the range is often stated to be between 10 and 15 percent of the projected cost of construction.

When you have made your selection, you'll need to draw up a contract. A contract with an architect or architectural designer should include a set price along with an itemized list of everything the fee encompasses. Basic architectural services include designing the home and preparing a complete set of construction plans that will be accepted and approved by the governing agency. The itemized list is extremely important because during the design of a home numerous variables will cause modifications, some minor and some significant. These modifications can add time and cost to the architect's or architectural designer's workload. Therefore, it is essential that the contract provide for adjustments in the conceptual and preliminary plan stages before the final set of construction plans is prepared. Then, too, you'll need to specify whether the architect or architectural designer expects extra pay for site visits. What about travel and telephone costs? Consultant services such as environmental, soils, drainage, and structural? Permit filing fees? Include everything you want the architect or architectural designer to accomplish and specify start/completion dates and payment schedules. Finally, have an attorney that specializes in architectural contracts review all contracts. If you are negligent on the communication of working terms, this could cost you a lot more money than you have budgeted for the design phase of the project. So be extremely specific in the contract that stipulates the work to be performed.

The purpose of the first meeting with your architect or architectural designer is to communicate the conceptual requirements of your new home and the spaces that you require to sustain your lifestyle. Go into the meeting fully prepared and in sync with your spouse or partner about your requirements. Review the site conditions and the challenges to building on the site. Review in detail your "wants" and "must-have" lists of desired elements. Discuss and review the parameters of architectural styles suited to your project.

After a few meetings and exchanges, your architect or architectural designer will develop a schematic conceptual plan he or she thinks fits your requirements. This phase conceptualizes the basis for the eventual design and construction, so make sure you understand what's presented to you and that the elements satisfy your requirements within your budget (and the requirements of any oversight authority). This includes the specifics of building materials, windows and doors, roofing, heating and air conditioning, plumbing, electrical and lighting, whole-house electronics, on-site energy generation (such as specific solar panels), and site development and landscaping, including pools and ponds—essentially all of the associated material items to be used to build your home. If you don't agree with your architect or architectural designer, communicate that you're not ready to sign off until you feel the plan is right. This is the time in every project where the back and forth interaction to get things right can surpass the budget if that cost variable isn't accounted for in the contract, and instead is added on as a per-hour design cost.

Once you and your architect or architectural designer have come to an agreement on the conceptual plan of the home, the next stage is to translate concepts into detailed drawings representing form, function, and the delineation of spaces.

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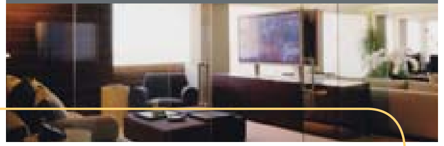

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At this conceptual stage it will be helpful if your architect or architectural designer can provide three-dimensional CAD exterior and interior perspectives so that you can better visualize the spaces and architectural look of the house and communicate your desired revisions.

At this point you should have determined the exact space requirements for living, including the kitchen, laundry, and bath fixtures that you want in your home so that precise cutouts can be specified in the plans to ensure that sufficient space has been allocated, both indoors and outdoors. This attention to detail should also address the universal design features of the exterior and interior of the home. It is wise to retain a universal design consultant, who is certified as a certified aging-in-place specialist (CAPS).

Prior to signing off on this stage, I recommend that your architect or architectural designer, or if need be an architectural illustrator you retain, render three-dimensional perspectives of the exterior of the home. Another option is a scale model. This is a preferred way to know what your home will look like when built. You will be able to easily see relationships and proportions as well as how the home relates specifically to the site.

After your approval of the exterior and interior space relationships, which define the character of the home, the next stage is the preparation of a set of plans for exterior environmental treatments, landscaping, soils analysis, grading, and on-site water management and energy generation. For the interior, a set of detailed plans will be required for fire sprinklers and energy-efficiency calculations. You should also specify the extent of electronic lifestyle features and products to be incorporated as well as appliances for the kitchen and other areas of the home.

It is essential that you ensure that at all times every member of your design team is working from the latest set of plans. Otherwise, this could cost you more money when you and/or your architect or architectural designer realize that certain plan details needed to be further modified because an older set of plans was used instead of the latest version.

At this point, if you've hired a contractor, make sure your architect or architectural designer is communicating with him or her. If you are an owner-builder, knowing how to read the set of plans will not only help you envision your new home but may save you money, enable you to speak authoritatively, and eliminate the element of surprise from construction.

The required set of plans provides exact information to the builder (or you as the owner-builder) and subcontractors on how to build your home. Plans show you what you are building (and what the bank construction loan is financing). The specifics are identified from site grading and drainage to construction materials and appliances. A complete set of plans and building schedules are required to enable local authorities to determine in advance whether your design satisfies all the engineering and safety requirements of the building codes that apply.

Review with your architect or architectural designer the complete set of plans to be submitted for approval. Typically, the set includes elevation plans of the exterior walls, floor plans diagramming each floor of the home, mechanical/electrical drawings, section drawings delineating the inside cavity of the home, site plans showing how the home and driveway will be situated on the lot and specifics of site development, detail charts showing enlarged sectional areas, specifications which detail the materials and techniques to be used in construction, and schedules detailing material makes, model numbers, and quantities.

Study the plans to ensure that everything is accurate and is what you desire. It's critical to consider and decide on any changes early on, not when construction begins. All changes should be put in writing, noting whether they were made by you or as the result of your architect's or architectural designer's or other team member's omission and/or error. Always double-check any new section of the plans to ensure the changes have been carried over throughout the entire set. Note changes with dates and initials to know which set is most current. Keep a record of all plan versions with dates.

If, by this time, you haven't hired a contractor, use the set of construction documents as a bid package to enlist bids from the prospects you are considering. Assuming you make no further changes to the plans, the bids should represent the final cost of construction. If you do make changes, added costs and delays may result.

In the end, if you have prepared diligently, you should end up with the home of your dreams and still be within your budget. UHD

The Author

Gary Reber is the President of Ultimate Home Design, Inc. and the founding Editor-In-Chief and Publisher of *Ultimate Home Design* magazine. His diverse background in several fields includes an undergraduate, graduate, and post-graduate university education in architecture, community planning, and economic development planning. For years he was a consultant on community and economic development planning. For the past 15 years he has been an editor and publisher of magazines in the consumer electronics field. Gary can be reached at 951 676 4914 or gary@ultimatehomedesign.com.

UNIVERSAL DESIGN

don't buy, build, or remodel without it

Susan Mack, OTR/L, CAPS

Susan Mack was the Certified Aging-In-Place Specialist and universal design consultant on this "Home For Easy Living" located in Southern California.

Synopsis

- *One of the important considerations in universal design is flexibility.*
- *Universal design homes are designed to readily accommodate people who differ in height, size, strength, and mobility.*
- *Marketability and resale value are increased because you can sell your home to people of all ages and abilities; no one is excluded from buying your home because of unnecessary barriers and hazards.*

The Objective

The objective of universal design is to enhance products and environments to be usable by all people to the greatest extent possible. Most of us probably assumed that design has always been dedicated to that goal. Unfortunately, that has not been the case. Most outdated, traditional home designs were based on meeting the needs of an "average" person without consideration of the broad spectrum of human functional abilities and changes that occur throughout a lifetime.

Universal design is a leading-edge design concept that strives to accommodate human functional diversity and the future changes in how people perform their activities of daily living. The Principles of Universal Design can be applied to the community master plan, individual home floor plans, appliances, plumbing fixtures, interior decorating features, landscaping, telecommunications, and home electronics. This exciting new design concept is still evolving and can be applied to all kinds of design.

"With the rapidly changing demographics in this country, we really cannot afford to not incorporate universal design."

The Design Team

It is important to appreciate the value of a design team. The best results are achieved by a team of professionals who have depth of experience in architecture, engineering, interior design, landscaping, home electronics, and human functional diversity. As an occupational therapist since 1971, my knowledge of how the human body functions and changes during the life span is what I bring to the design team as a universal design consultant. This human-centered universal design perspective

This gorgeous award-winning kitchen is a fully accessible universal kitchen without the appearance of being accessible. Beauty and function join together to provide the best in flexibility of use. Multiple work surface heights, easy-to-reach storage, universal cabinets, enhanced lighting, work efficiency, and ergonomic fixtures and appliances all in one!

These universal cabinets appear to be standard cabinets when the cabinet doors are closed. However, they quickly accommodate someone who wishes to sit while preparing dinner after a long day. The smooth cooktop is located near the kitchen sink to make it safer and easier to transfer a pot of boiling water to the sink to pour it out. The breakfast nook table provides a lower work surface for a seated cook.

This elegant universal shower provides the choice of two styles of showerheads (his and hers!), designer safety handrail, and low-threshold entry with ample floor space to enhance ease of use. The tub has a deck with designer grab bars to make getting in and out easier and safer. The lavatory is built into a universal design cabinet to allow the homeowner to sit comfortably while performing daily grooming activities.

The grand double-door entry into the master bedroom creates a stunning entry while allowing for ease of moving in large pieces of furniture. Lower windowsills expedite emergency egress.

creates homes that enhance ergonomic fit, safety, health, work efficiency, comfort, convenience, social participation, marketability, and ultimately, freedom of choice.

The Invention Of Simple Machines

Why are simple machines invented? How can wheels, levers, inclines, and pulleys reduce the burdens of life and enhance comfort for all of us when incorporated into ergonomic universal home design?

The wheel was created to reduce the burden of carrying heavy loads. Over 110 million Americans report back pain. If we went to the trouble of inventing wheeled conveyances to reduce stress to our backs and joints, we need to create environments that allow us to use wheeled devices. With the enactment of the Americans With Disabilities Act (ADA), the government mandated that public structures be built to allow for passage of people using wheelchairs. Most of us have benefited from that requirement when we have been pulling along our roll-on luggage. The delivery men and women who use dollies certainly have benefited. Sloped walkways (inclines) without steps up to the porch or at the door allow us to roll in our baby strollers and grocery carts. Eliminating unnecessary steps enhances safety by reducing the risk of trip-and-fall injuries. Falls in and around the home are the leading cause of injury-related deaths in people over the age of 65. Reducing the risk of falls is an essential component of extending active healthy living.

Lever door handles make opening doors easier when you are carrying groceries or children and reduce the stress on joints in the fingers and wrists. Lever faucet handles reduce the repetitive stress to joints and are more hygienic. When your hands are dirty, you can turn a lever faucet handle on and off with your elbow without touching it with your dirty hands. This can reduce the spread of germs from one family member to another. Motion sensor faucets are even better at avoiding unnecessary transfer of germs.

In the Optimum Performance Home™ at The Sea Ranch (featured in the Premiere Issue 1, January/February 2006 of *Ultimate Home Design*), the house is designed to perform better and to support the homeowners ability to perform better as well. Having easy-to-reach storage, efficient workflow, and workspaces designed to allow the homeowner to work while seated is much more work efficient and convenient than bending,

stretching, running around, and standing unnecessarily. Work efficiency in the design of the home will leave the homeowners with more time and energy for social and creative activities.

By incorporating the Principles of Universal Design into the design of the Optimum Performance Home at The Sea Ranch, the homeowners will be able to welcome people with diverse abilities to be their guests. The master bedroom suite is on the ground floor, conveniently located close to the social hub of the home. The office on the ground floor has space allocated for a Murphy bed for guests. Two of the guest bedrooms and a study/library/surround music room, which can be used as a guest bedroom, are upstairs, but space was allocated for an elevator to be installed if desired in the future.

One of the important considerations in universal design is flexibility. Universal homes are designed to readily accommodate people who differ in height, size, strength, and mobility. Some people may be disabled in a medical sense, but they are handicapped by an environment that imposes unnecessary barriers. It may be just a matter of a few inches to create a more inclusive design that values social integration of people of all abilities. Marketability and resale value are increased because you can sell your home to people of all ages and abilities; no one is excluded from buying your home because of unnecessary barriers and hazards.

Independence And Self-Reliance

We are living longer than ever before so our homes need to be designed to support our desire to stay in our own homes as long as possible. Universal design supports this desire to “age in place” by creating homes that facilitate independence/self-reliance, as well as allow us to recover from illness or injury in the comfort of our own homes rather than in an impersonal institutional setting. Our homes need to be designed to support in-home caregiving, which many long-term care insurance plans are now covering. Traditional homes are full of unnecessary hazards and barriers to in-home caregiving. Universal design can be incorporated into new home designs and remodeling projects to provide us with freedom of choice of where we want to live. The savings from deferred institutional living can quickly recoup the cost of incorporating universal design. With the rapidly changing demographics in this country, we really cannot afford to not incorporate universal design.

Multigenerational Families

Many homes now have three or four generations of family members living together. Universal homes accommodate multigenerational families by addressing the environmental needs of the grandchildren as well as the grandparents. The Optimum Performance Home at The Sea Ranch is designed to accommodate the homeowners’ current, as well as future, family needs.

Benefits Outweigh Costs

Universal homes are aesthetically more attractive because of the more open, spacious floor plans and enhanced natural lighting. Universal design is value-added design! The additional cost of incorporating the Principles of Universal Design is only a few thousand dollars when done at the beginning of new home design. The benefits far outweigh the additional costs. The specific universal fixtures (comfort height toilet, grab bars, etc.) should be offered as options, which would be selected and paid for by the homebuyers as they desire.

Conclusion

Why would anyone want to buy a house with unnecessary hazards and barriers?

We need to let the home building industry know that we will not settle for the status quo.

Next time you are touring model homes, ask to see the universal design models. When talking with your remodeling contractor, tell him or her that you want your home addition and/or remodeling to include universal design features. We should want only the best: universal homes that provide us with optimum performance! UHD

The Author

As an occupational therapist for over thirty years, Susan Mack, OTR/L, CAPS, has been involved with modifying products and homes for people of all ages and abilities. When consulting with developers, architects, and remodeling contractors, she utilizes her knowledge of human functional diversity and changes over the lifetime to synthesize the principles of universal design into marketable universal floor plans and specifications. She received the 2001 and 2004 Gold Awards from the National Association of Home Builders for her universal design consulting work on market-rate universal homes in California and Ohio. She is President of Homes for Easy Living Universal Design Consultants. She is the Universal Design Consultant for the Optimum Performance Home at The Sea Ranch. She can be reached at 760 409 7565 or smack@homesforeasyliving.com (www.homesforeasyliving.com).

Photo Credits

Susan Mack, Home For Easy Living - All photos.

Rainforest Alliance

guide to green building wood sources

Rick Hilton

A Comprehensive Directory Of FSC-Certified Flooring And Sustainable Wood BuildingProducts

From flooring to shingles, Forest Stewardship Council (FSC) certification is universally recognized as the green standard for wood building products. Yet, architects and contractors often face challenges finding certified sources for these products. Responding to this information gap, the Rainforest Alliance has compiled the SmartGuide to Green Building Wood Sources, a comprehensive listing of FSC-certified suppliers in North America, including contact, company, and product information.

Synopsis

- *The SmartGuide is part of a Rainforest Alliance program to link consumers of FSC-certified wood building products with the growing supply available in the United States.*
- *The SmartGuide helps consumers locate suppliers of certified wood flooring materials and other wood building products, offering details such as contact information, products, and regions served in North America.*

Below: Brazilian Cherry Genua flooring from Kahrs, photo courtesy of Kahrs. Right: flooring from Harrop-Procter Forest Products Flooring, photo courtesy of Cam Brewer

Rainforest Alliance

Reprinted in this Premiere Issue of *Ultimate Home Design* is the flooring section of the SmartGuide. The full SmartGuide to Green Building Wood Sources can be downloaded at www.rainforest-alliance.org/greenbuilding.

The SmartGuide is part of a Rainforest Alliance program to link consumers of FSC-certified wood building products with the growing supply available in the United States. The market for these products is driven, in large part, by the rise of the green building movement. The United States Green Building Council (USGBC) has established the Leadership in Energy and Environmental Design (LEED®) rating system to set standards for green building. Other organizations promoting green building have defined similar standards. These standards consistently encourage, if not mandate, use of FSC-certified wood for architects, designers, and contractors seeking to earn a green rating for a building project.

Until now, many have perceived obstacles to earning green building credits for FSC-certified wood because sourcing the wood was believed to be too difficult and time consuming. The SmartGuide helps consumers locate suppliers of certified wood flooring materials and other wood building products,

"From flooring to shingles, Forest Stewardship Council (FSC) certification is universally recognized as the green standard for wood building products."

offering details such as contact information, products, and regions served in North America. These suppliers are FSC-certified by the Rainforest Alliance's SmartWood Program or other accredited certifiers for cabinets and casework, decking, doors and windows, engineered wood products, exterior applications, flooring, framing and dimensional lumber, furniture, millwork, and plywood, sheathing, and engineered wood panels—oriented strand board (OSB).

The mission of the Rainforest Alliance is to protect ecosystems and the people and wildlife that depend on them by transforming land-use practices, business practices, and consumer behavior. Headquartered in New York City with offices around the world, the Rainforest Alliance works hand-in-hand with landowners and operators in the forestry, agricultural, and tourism sectors to make their practices environmentally and socially responsible. The Rainforest Alliance also provides market linkage services to companies and forestry communities as well as training and technical assistance to indigenous and community forestry operations to increase access to and benefits from forest certification. SmartWood is the forestry certification arm of the Rainforest Alliance and is accredited by the FSC, an international body that establishes certification standards, and accredits and monitors certifiers.

For more information visit http://www.rainforestalliance.org.

The FSC was founded by a diverse group of industry and environmental stakeholders, including the Rainforest Alliance, to develop a consistent, comprehensive, and reliable set of third-party certification standards, and to ensure that they are universally recognized. FSC certification, whether of large forest management companies, small non-industrial landowners, indigenous landholders, community operations, or public lands, is carried out by SmartWood's global network of regional offices and partners, as well as other certifiers. UHD

The Author

Rick Hilton is the Rainforest Alliance's New York Green Building Specialist. Based in New York City at 665 Broadway, Suite 500, NY 10012-2331, he can be reached at 212 677 1900 or rhilton@ra.org.

Rainforest Alliance

Company and Contact Info	Products	Product Details	Manufacturer, Distributor, Both	Custom Products, Stock or Both	State	Country	INTernational, N. AMerica, NATional, REGional
Adirondack Hardwoods/Saranac Hollow Woodworking www.saranachollow.com 518.293.8424	Flooring		B	C	NY	USA	REG
All Native Hardwoods www.allnativehardwoods.com 541.672.8851	Flooring	Madrone, myrtle, maple, fir, chestnut	B	B	OR	USA	
Allegheny Mountain Hardwood Flooring www.hickmanwoods.com 724.867.9441	Flooring	Red oak, white oak, cherry, specializing in rift and quarter sawn red and whilte oak solid wood flooring	B	S	PA	USA	NAT
Anderson Hardwood Floors www.andersonfloors.com 864.833.6250	Engineered/laminated flooring	Must be special ordered	B	C	SC	USA	NAT
Babcock Lumber Company www.babcocklumber.com 800.268.7395	Hardwood lumber, stair parts, moldings, flooring, door jambs, cabinet components, furniture components	red oak, poplar, white oak, ash, cherry, hard maple, soft maple	B	B	PA	USA	INT
BOA FRANC www.boa-franc.com 418.227.1181	Flooring		B	S	QC	CAN	NA
Canadian Eco-Lumber Co-op www.ecolumber.ca 604.278.4300	Flooring, decking		D	B	BC	CAN	INT
CitiLog www.citylogs.com 877-citylog	Flooring	Oak, maple, cherry, walnut, pine, etc	B	C	NJ	USA	REG
Collins Company/Kane Hardwood www.collinswood.com 814.837.6941	VersaWood flooring	Tongue and groove, square one face, V-joint one face, random length	B	B	PA	USA	INT
Craftmark, Inc www.craftmarkinc.com 503.472.6929	flooring	Oak, maple, fir, hemlock, and cedar	D	S	OR	USA	NAT
Dwight Lewis Lumber/Lewis Lumber Products www.lewislp.com 800.233.8450	Flooring, decking	Hardwoods	B	S	PA	USA	REG

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Company and Contact Info	Products	Product Details	Manufacturer, Distributor, Both	Custom Products, Stock or Both	State	Country	INTernational, N. AMerica, NATional, REGional
Earthsource www.earthsourcewood.com 510.208.7257	Flooring	Machiche, granadillo, Santa Maria, chechen, pucte, chichipate, jobillo	D	S	CA	USA	NAT
Eco Elements Inc www.ecoelements.ca 204.255.3779	Flooring	See website	D	S	MB	CAN	NAT
Ecotimber www.ecotimber.com 415.258.8454	Flooring		D	B	CA	USA	NAT
Edensaw Woods www.edensaw.com 360.385.7878	Flooring	See website	B	C	WA	USA	INT
Endura Wood Products www.endurawood.com 503.233.7090	Flooring	Maple, cherry, birch, Oregon black birch, red oak, white oak, tanoak, Pacific madrone	B	S	OR	USA	REG/NAT
Environmental Building Supplies www.ecohaus.com 503.222.3881	Flooring	Red oak, quarter-sawn White oak, quarter-sawn Maple, quarter-sawn Maple, plain-sawn Cherry, quarter-sawn Chocolate (stained) oak Walnut, quarter-sawn, South American: Brazilian cherry White tigerwood Teak	D	S	OR	USA	NAT
Environmental Home Center www.environmentalhomecenter.com 800.281.9785	Flooring		D	S	WA	USA	NAT
Evergreen Ecoforestry www.nas.com/evergreen 360.592.3123	Lumber, timbers, millwork, siding, flooring, moldings, trim		B	B	WA	USA	NAT
Finewood Flooring and Lumber Ltd 902.295.2874	Flooring	Sugar (hard) maple, yellow birch, beech, ash, oak	M	S	NS	CAN	INT
Flooring Alternatives www.flooringalternatives.com 877-639-1345	Flooring	Domestic (maple, cherry, oak, walnut, tanoak, madrone) and exotic (brazilian cherry, Patagonian teak, tiger wood, white tiger wood, cumaru)	D	S	CA	USA	NAT

Rainforest Alliance

Company and Contact Info	Products	Product Details	Manufacturer, Distributor, Both	Custom Products, Stock or Both	State	Country	INTernational, N. AMerica, NATional, REGional
Gammapar www.gammapar.com	Flooring	Prefinished and engineered - see website	B	S	VA	USA	INT
Golden State Flooring (Division of Higgins Lumber Company) www.goldenstateflooring.com 415-522-5120	Flooring	See website	D	S	CA	USA	NAT
Goodfellow Inc. www.goodfellowinc.com	Flooring	Teak, beech	D	S	QC, NY, NH, WA, OR	USA / CAN	NAT
Green Mountain Woodworks www.greenmountainwoodworks.com 1-541.535.5880	Flooring, stairs	Native wood, tanoak	B	C	OR	USA	REG
Green River Lumber www.greenriverlumber.com 413.528.9000	Flooring	Cherry	B	S	MA	USA	INT
Harris-Tarkett, Inc www.harristarkett.com 800.842.7816	Flooring	Solid and engineered (planks, longstrip, strips)	B	S	TN	USA	INT
Harrop Proctor Community Co-Operative www.hpcommunityforest.org 250.229.2221	Flooring, decking		B	B	BC	CAN	REG
Healthy Forests, Healthy Communities Partnership www.sustainablenorthwest.org 503.221.6911	Flooring		B		OR	USA	
Jolyka Bolivia SRL www.jolyka.com 410.272.2772	Flooring	Double layered engineered - all engineered flooring is certified, some solid flooring is. tiete rosewood, cumaru, jatoba, purple heart, maple, nogal, canary wood, santos mahogany, brazilian cherry, maria, goncalo alves, white goncalo alves	B	S	MD	USA	NAT

Rainforest Alliance Company and Contact Info	Products	Product Details	Manufacturer, Distributor, Both	Custom Products, Stock or Both	State	Country	INTernational, N. AMerica, NATional, REGional
Kahrs www.kahrs.com 800.800.5247	Flooring		B	S	FL	USA	NAT
Kaster's Kustom Cutting Inc kasterscustom@yahoo.com 503.829.4167	Flooring	White oak	B	B	OR	USA	REG
Kelly-Goodwin Company www.kellygoodwin.com 800.452.1647	Flooring	Prefinished, unfinished	D	S	OR, WA, MT	USA	REG
Lewis Lumber Products www.lewislp.com 570.584.4460	Hardwood lumber, molding, flooring, paneling, chips, saw dust	black cherry, n. red oak, red maple, hard maple, white oak, ash, eucalyptis grandis, call for other inquiries	B	B	PA	USA	INT
Living Forest Cooperative, Inc www.livingforestcoop.com 715.682.0007	Flooring	See website for many details	B	B	WI	USA	REG
Next Generation Woods www.nextgenwoods.com 540.639.3077	Flooring	Primarily hardwoods	B	C	VA	USA	NAT
North American Wood Products, Inc www.nawpi.com 503.620.6655	Flooring	See website for many details	D	B	OR	USA	INT
Nova Distinctive Floors www.novafloorings.com 866-5762458	Flooring	Cork and Linoleum Floors. Cork Underlayment for sound barrier	B	S	CA	USA	INT
Oak Hill Veneer www.oakhillveneer.com 570.297.4137	Veneer	Primarily hardwood veneer; call for species availability	M	C	PA	USA	INT
Red Hills Lumber Company www.redhillslumberco.com 229.227.3595	Flooring	Long leaf heart pine flooring	B	B	GA	USA	INT
Rex Lumber Company www.rexlumber.com 978.263.0055	Flooring	Hardwood flooring	D	C	MA, VA, CT, NJ	USA	NAT

Rainforest Alliance Company and Contact Info	Products	Product Details	Manufacturer, Distributor, Both	Custom Products, Stock or Both	State	Country	INTernational, N. AMerica, NATional, REGional
Royal Plywood Company patti@royalplywood.com 949.547.6837	Hardwood lumber, hardwood plywood, softwood lumber, softwood plywood, dimensional lumber, sheathing, forms, lagging, decking, flooring, glulams, particleboard, moldings and trim	Stocking product and special orders	D	B	CA	UAS	NAT
Swedeco Wood Floors www.swedeco.com 360.698.1974	Flooring	Prefinished engineered - available in 70% and 100% FSC: white oak, northern red oak, ash, sap gum, pecan/hickory, walnut, american cherry, manchiche, t'zalam, brazilian cherry (jatoba), brazilian walnut (ipe), chechen; reclaimed: antique southern yellow pine, antique fir.	B	S	WA	USA	INT
Sylvan Industries LLC www.sylvanindustries.com/products 503.639.9000	Flooring		D		OR	USA	
The Bahr Company www.thebahrco.com 800.533.9460	Flooring	See website	B	S	IL	USA	NAT
Timber Products www.timberproducts.com 541.744.4209	Flooring				OR	USA	
TimberKnee, Ltd. www.timberknee.com 800.720.9823	Flooring	Cherry, maple, yellow birch, white/red oak, ash, eastern white pine	B	B	VT	USA	INT
Universal Forest Products www.ufpi.com 909.826.3000	Flooring		B	S	CA	USA	NAT
Upper Mississippi Certified Group http://www.co.aitkin.mn.us/departments/Land%20Dept/land-dept/UMCG.htm 218.927.7305	Flooring		B	S	MN	USA	
Vermont WoodNet www.vtwoodnet.org 802.274.8075	Flooring		M	C	VT	USA	NAT

Rainforest Alliance

Company and Contact Info	Products	Product Details	Manufacturer, Distributor, Both	Custom Products, Stock or Both	State	Country	INTernational, N. AMerica, NATional, REGional
Wheeland Lumber Company www.wheelandlumber.com 570.324.6042	Hardwood lumber, dimensional lumber, moldings, flooring, bark, woodchips, bark mulch	cherry, hard maple, soft maple, white ash, N. red oak, white oak	M	B	PA	USA	INT
Wild Thyme Farm www.wildthymefarm.com 360.459.0946	Lumber, millwork, flooring, moldings, trim, furniture		B	B	WA	USA	NAT
Windfall Lumber www.windfalllumber.com 360.352.2250	Flooring	White oak, Brazilian cherry	B	C	WA	USA	NAT
Wood Flooring International www.wflooring.com 856.764.2501	Flooring		D	S	NJ	USA	INT

SmartGuides include information that was available at the time of publication and may not be a complete listing of all sources, products or regions served. They are compiled from a number of sources including FSC (http://fsc-info.org/english/dbcoce.asp), SmartWood (http://www.brandsystems.net/smartwood/) and Metafore (http://www.metafore.org/?s=147) databases, individual source interviews and company websites. For additions or updates to the Rainforest Alliance's SmartGuides, or for questions about them, please contact Rick Hilton at rhilton@ra.org. This SmartGuide was updated on October 19, 2005.

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resulting in green building rating systems confusion

Charles Kibert. PhD

"The short version of a description of a green home is that it is healthy, energy- and water-efficient, environmentally responsible, and climate responsive."

Synopsis

- *A variety of programs in many areas of the United States are providing green building options at very reasonable and affordable prices.*
- *Determining exactly what is green or not green, and indeed what shade of green, has been a challenge for the building industry.*
- *Competing standards provide competition, which may result in improved rating systems, or simply allow the building industry to opt for the cheapest and easiest route to certification.*

"Green" Certification

Homebuyers today have the possibility of acquiring superior homes that are designated as being "green." The short version of a description of a green home is that it is healthy, energy and water efficient, environmentally responsible, and climate responsive. A variety of programs in many areas of the United States are providing these options at very reasonable and affordable prices.

The green-building movement in general is accelerating in its penetration of commercial, institutional, and residential markets in the U.S. Determining exactly what is green or not green, and indeed what shade of green, has been a challenge for the building industry. Building assessment and rating systems have appeared to both help and cloud how to best make these determinations. Since 1998, the U.S. Green Building Council (USGBC) has been issuing a variety of green building assessment systems known as LEED® (Leadership in Energy and Environmental Design). The LEED standard for New Construction, or LEED-NC, which applies to new commercial or institutional buildings, was the first green building systems out of the box. Over 200 million square feet of buildings have been placed in this USGBC program, the outcome of which is a rating and certification of the building as Platinum, Gold, Silver, or Certified. The USGBC LEED suite of standards can be found at http://www.usgbc.org.

Austin Green Building Program

Residential green building programs are generally more developed and have a longer history than that of commercial/institutional buildings. The first program that addressed residential construction started as an effort of the City of Austin, Texas, in 1990, and the program received a special award at the Rio de Janeiro Sustainability Summit in 1992. Over 4,000 homes have been certified under this program since its official launch in 1993, demonstrating both its acceptance and success. It offers five levels of certification, ranging from one to five stars. Version 7.2 of the Austin Green Building Program is the current edition of this residential green building standard and program. Additional information about the City of Austin Green Building Program and its highly acclaimed Sustainable Building Sourcebook can be found at http://www.ci.austin.tx.us/greenbuilder. The program is voluntary, and self-certification is the method of determining compliance, as is the case for many of the residential programs around the U.S.

NAHB Green Building Guidelines

Most of the residential green building programs that followed on the heels of Austin's success had their genesis in local member organizations of the National Association of Home Builders (NAHB), which issued a set of green building guidelines to assist their local homebuilder organizations in the development of their own programs. A copy of the NAHB's Green Building Guidelines can be found at http://www.nahb.org.

An NAHB study completed in 2002 indicated that there were 26 green building programs that had been started in local home builder associations. A link to this study can be found at http://www.nahbrc.org/green3.asp?CategoryID=1801.

Built Green Colorado

One of the highly successful programs that inspired the NAHB to issue these guidelines was Built Green Colorado, which originated in the Denver Home Builders Association (HBA) in 1995 and then quickly spread statewide. To date, over 25,000 homes have been certified in a three-tier rating system based on self-certification. More detailed information on the Built Green Colorado program is available at http://www.builtgreen.org.

EarthCraft House

One of the highly successful programs that resulted from the NAHB guidelines is the EarthCraft House, a program of the Greater Atlanta Homebuilders Association, which is administered by the non-profit Southface Energy Institute in downtown Atlanta, Georgia. Details of this program can be found at http://www.southface.org. Unlike many other residential programs, the EarthCraft House program requires each home to be inspected by specially trained inspectors working under the guidance of the Southface Energy Institute, thus providing an independent third-party evaluation of construction. Over 2,000 homes in the greater Atlanta region have been certified under the EarthCraft Program.

Florida Green Building Coalition

In some jurisdictions, the green building program is organized by an independent organization, as is the case in Florida, where the Florida Green Building Coalition (FGBC) has developed a standard for residential construction that is being slowly adopted by builders and developers throughout the state. To date, about 200 homes have been certified in a program that has only one level of achievement and which requires third-party certification. Complicating matters further in Florida is a recent effort by the Florida Home Builders Association to develop a green building standard for Florida. Additionally, the USGBC is in the process of launching LEED for Homes, and consequently three standards may be competing for attention in Florida. LEED for Homes is generally intended for jurisdictions without green builder residential programs, but it in fact will be competing with existing standards in many regions. The FGBC Web site contains their residential standard plus an additional standard directed at land development. The Web site is located at http://www.floridagreenbuilding.org. Not to be outdone, the USGBC is issuing a standard known as LEED-ND, or LEED for Neighborhood Development, which will also be competing with development standards such as that created by the FGBC.

Competition

Clearly these competing standards are dual-edged. They provide competition, which may result in improved rating systems or simply allow the building industry to opt for the cheapest and easiest route to certification. The situation in Florida is potentially very troublesome with three competing and conflicting programs from which to choose. The good news is that the USGBC, FGBC, and NAHB are discussing how to resolve this potential impasse, and the result may be a single standard based on collaboration among the major players. Similar conflicts may occur in other areas of the U.S. where LEED for Homes and local standards collide. Hopefully, good will and good intentions will result in green residential programs that provide the truly superior, healthy, and efficient homes that are being demanded by homebuyers. Homebuyers should consult with their building department, their local home builders association, or the USGBC to determine if a green building program is in effect in their area. UHD

The Author

Charles Kibert, Ph.D., is Professor of Building Construction at the University of Florida in Gainesville. His latest book, entitled *Sustainable Construction—Green Building Design And Delivery* is a definitive work. He is an Editorial Director of the Green Building Department of *Ultimate Home Design*. Charles can be reached at 352 273 1189 or ckibert@ufl.edu.

MAXIMUM PERFORMANCE (MaP)

testing of popular toilet models

William Gauley & John Koeller

Background

Although virtually all toilet fixtures sold in Canada and the United States meet both the flush volume and performance certification requirements of the respective plumbing standards organizations, there remains some question as to whether fixtures that meet only the minimum certification requirements also meet the expectations of the consumer. What's more, since certification testing offers only pass/fail grading, there is currently no easy way to distinguish between superior and marginal toilet fixtures available in the market.

Synopsis

- *The MaP testing project was developed to identify how well popular toilet models perform using a realistic test medium, and to grade each toilet model based on this performance.*
- *Although other toilet performance studies have been conducted, none of these has been performed using a test medium as realistic as that used in the MaP testing.*
- *The report ranks the performance of 214 different toilet models.*

Top: American Townsend™ Champion®, Middle: Gerber Ultra Dual Flush, Bottom: Kohler Wellworth® Pressure Lite™

Top: TOTO® Drake, Middle: Western Pottery Challenger Hi-Boy, Bottom: Mansfield EcoQuantum

While the majority of residential toilet fixtures exceed customer performance expectations while flushing with no more than 6 litres (1.6 gallons) of water, recent cooperative research in Canada and the United States concludes that there are some certified and commercially available fixtures that probably do not meet customer expectations. Others, however, far exceed them and deserve to be considered in the consumer's purchase process. As a result of this research, Maximum Performance (MaP) testing has become an accepted measure of performance.

Two key concerns led the researchers to develop the MaP testing scale:

1) Fixtures that fail to meet the maximum 6-litre flush requirements of the Canadian standards or the 1.6-gallon requirements in the United States may result in toilets that flush with either too much or too little water; in both cases, performance can suffer.

2) Fixtures that do not remove all the waste in one flush usually result in customer complaints and double flushing; as such, a measurement of waste removal was required.

> "This study revealed a significant range in the maximum performance levels of the toilet fixtures tested..."

Generally, the lack of information on toilet performance has served to perpetuate a negative perception regarding 6-litre (1.6-gallon) technology.

Although other toilet performance studies have been conducted, none of these has been performed using a test medium as realistic as that used in the MaP testing, nor has a quantifiable performance benchmark—based on the results of relevant medical data—been established.

The MaP testing project was developed to identify how well popular toilet fixtures perform using a realistic test medium, and to grade each toilet model based on this performance. A soybean paste having similar physical properties (density, moisture content) to human waste was used in combination with toilet paper as the test medium. In addition, all toilet samples are adjusted, where possible, to their rated flush volume (typically 6 litres/1.6 gallons) prior to testing to ensure a level playing field.

The developed testing protocol required the soybean paste to be extruded through a 7/8-inch (22-mm) die and cut into 50-gram specimens (each specimen approximately

Test Rig

Bulk Media

Extruded Media

Adding Media To The Bowl

Maximum Performance (MaP) Test

Critical Aspects Of Test

MaP testing includes three significant advancements from earlier studies:

• Non-realistic test media (sponges, plastic balls and beads, construction paper, etc.) has been replaced with a combination of extruded soybean paste and wads of toilet paper. Most agree this medium more accurately replicates "real-world" demands upon a toilet fixture.

• All models are adjusted to a rated volume, generally 6 litres (1.6 gallons), prior to testing.

• A minimum level of acceptable performance has been identified.

Minimum Level Of Acceptable Performance—Medical Data

A British medical report outlines the results of fecal tests completed on 10 male and 10 female subjects eating normal diets. The study identified the average maximum fecal size of the male participants to be approximately 250 grams and the 95th percentile size to be 305 grams. The average maximum for women was slightly less at 237 grams, with the 95th percentile at 275 grams. The average fecal size of all participants was 130 grams.

Based on this medical study, it appears that for sanitary reasons, as well as for customer satisfaction, toilets should flush a minimum of approximately 250 grams of solids in a single-flush operation. Therefore, for the purposes of this study, 250 grams (250g) was set as a performance benchmark.

The accompanying photos help to illustrate some of the aspects involved in MaP testing.

Soybean Paste Test Medium

Soybean paste was selected as a test medium because its physical characteristics (density, moisture content) are reasonably similar to those of human waste. The medium is extruded through a 7/8-inch (22-mm) diameter die, each specimen being approximately 4 inches (100 mm) long and weighing 50 grams (±5 grams).

Medium Source

Although several specimens with varying physical characteristics were evaluated during initial project development, the specific medium used in the MaP testing is purchased from a single Canadian importer (the product originates in Japan). Readers wishing further information regarding the paste should contact Veritec directly.

Test Protocol

MaP test protocol (2003) is included in Appendix A of the 5th Edition of the MaP Report. (MaP test protocol Version 2—September 2005. This protocol will be used in subsequent testing and is included in Appendix E.) Both Appendix A and E can be viewed at www.UltimateHomeDesign.com. All toilet fixtures are assembled, placed on the test stand, and connected to a water supply (50psi static pressure). Tank water levels are set to the waterline and flush volumes recorded. Adjustments are made, if necessary, to ensure all samples flushed in a single operation with their rated volume, generally 6 litres (1.6 gallons).

The ability of a toilet to completely remove 100 percent of waste in a single flush without plugging or clogging is considered by many to be one of the most important test criterion. Testing was conducted by loading the fixture in 50-gram increments of test medium until it failed to pass 100 percent of the medium in two of three attempts. Four loosely crumpled balls of toilet paper (six sheets each) were included in each test.

100mm or 4 inches in length). Toilet fixtures were subjected to progressively larger loadings (in 50-gram increments) until the unit failed to completely clear the bowl in two of three attempts, or to fully restore a minimum 50-mm (2-inch) trap seal.

Readers interested in the background for the 6th Edition of the MaP testing report, in viewing the test protocol, and in obtaining all of the technical details on each of the 214 tested toilet fixtures should download the Full Test Report from the California Urban Water Conservation Council Web site (www.cuwcc.org/MapTesting.lasso), www.cwwa.ca/home_e.asp ("What's New" section), or veritec.ca ("Reports").

The minimum performance threshold adopted by MaP is 250g. This value is based on the results of a British medical study (Variability Of Colonic Function In Healthy Subjects) that identified 250g as the average maximum fecal size of the male participants in the study. Any toilet that meets or exceeds the 250g performance threshold should readily meet customer expectations for flushing. The MaP performance column in the study identifies the maximum number of solid grams the toilet model could flush in a single-flush operation. For example, a value of 350 means that the model could completely flush 350 grams of waste but did not clear 400 grams.

Overall, the MaP testing protocol appears to be well received by both water providers and manufacturers alike. MaP is being used throughout North America by builders, designers, specifiers, retailers, consumers, and others to aid them in their toilet purchase decisions. Similarly, many water agencies and municipalities consider the results of MaP testing when evaluating which toilet fixtures to subsidize or rebate in their water conservation programs.

Conclusions

This study revealed a significant range in the maximum performance levels of the toilet fixtures tested, from well below 250 grams for some models to over 1,000 grams for others—yet all of these toilets are certified as meeting the minimum standards set forth by national standards organizations. Caveat emptor!!

MaP Report tables on the following pages provide the most essential performance information on each of the tested fixtures, including the MaP score and selected physical characteristics of each of the products.

Recommendations

With regard to toilet fixture performance, designers and purchasers should only consider toilet fixtures that remove at least 250 grams of solids in a single-flush operation. UHD

Contributors

Initiated in 2003 by municipalities and other interested organizations in Canada, the Maximum Performance (MaP) Testing program was a cooperative effort between Canadian and American partners, including:

In Canada

• Canadian Water and Wastewater Association (CWWA) - LEAD AGENCY
• B.C. Capital Regional District, Victoria, British Columbia
• B.C. Buildings Corporation, Victoria, British Columbia
• Canada Mortgage and Housing Corporation
• Calgary, Alberta
• Edmonton, Alberta
• Greater Vancouver Regional District, British Columbia
• Halifax, Nova Scotia
• Hamilton, Ontario
• Montreal, Quebec
• Ottawa, Ontario
• Region of Durham, Ontario
• Region of Halton, Ontario
• Region of Peel, Ontario
• Region of Waterloo, Ontario
• Toronto, Ontario
• Winnipeg, Manitoba

In The U.S.A.

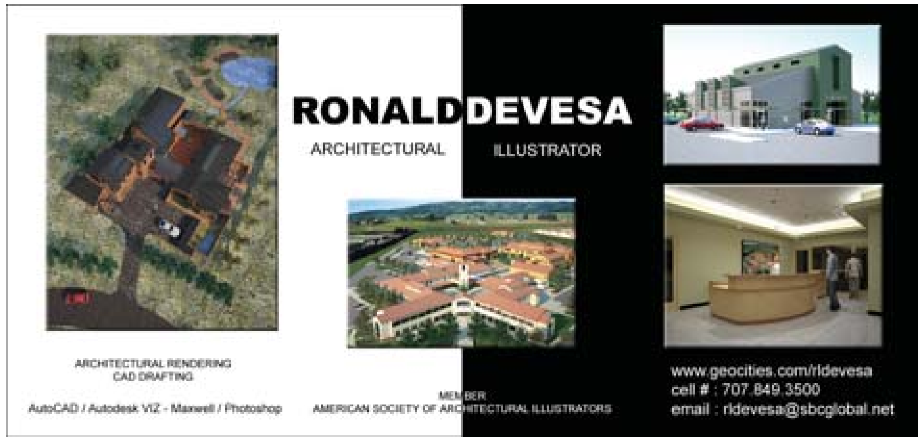
• California Urban Water Conservation Council, Sacramento, California
• East Bay Municipal Utility District, Oakland, California
• Los Angeles Department of Water and Power, Los Angeles, California
• Seattle Public Utilities, Seattle, Washington
• Tampa Bay Water, Clearwater, Florida

We gratefully acknowledge the contributions from these participating agencies and municipalities.

The Authors

John Koeller is a professional engineer and principal of Koeller and Company of Yorba Linda, California. Koeller and Company specializes in advising municipalities and water agencies throughout the U.S. in water-efficient technologies and products for their water conservation programs. He serves on the plumbing standards organizations in the U.S. and Canada, representing the interests of a number of water utilities. He is a technical advisor to the California Urban Water Conservation Council and is a frequent contributor of his expertise to a number of local, regional, and national green building initiatives. John can be reached at koeller@earthlink.net.

Bill Gauley is a professional engineer and founder and principal of Veritec Consulting Inc., Mississauga, Ontario, Canada. Whether he's designing a long-term water-efficiency plan for a municipal client, or developing a more realistic performance test for toilet fixtures, Bill brings a practical, hands-on approach to the various water efficiency programs he is involved in. Bill can be reached at bill@veritec.ca.



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Maximum Performance (MaP) of Toilet Fixtures - Sorted by PERFORMANCE

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Make	Model	Model Number	MaP Flush Performance (HIGHER IS BETTER)	1-piece model	2-piece model	Round Front Bowl	Elongated Bowl	ADA / Comfort Height	1.6G (6L) Gravity-flush	1.6-G (6-L) Power OR Pressure-Assist	Dual-Flush	Max 1.1-G (4-L) Pressure-Assist	Max 1.28 G (4.8 L) Gravity
Komet	Deco	DE 627 bowl, DE 611 tank	75		*	*			*				
American Standard	Cadet	2898: 4112 tank, 3459 bowl	125		*		*		*				
American Standard	Cadet	2798: 4112 tank, 3454 bowl	150		*	*			*				
American Standard	Hamilton	2092-0170-20	150	*			*		*				
Briggs	Abingdon III	4229: 4875 bowl, 4440 tank	150	*		*			*				
Briggs	Altima III	4232: 4320 bowl, 4430 tank	150		*	*			*				
Eljer	Canterbury	081-1620-00	150	*		*			*				
Eljer	Patriot	091-2120: 141-2120 tank, 131-2120 bowl	150		*	*			*				
Gerber	Aquasaver	21-712: 28-790 tank	150		*		*		*				
Niagara	Niagara Turbo RF	N2220	150		*	*			*				
Orion	Iris	50073 bowl, 51073 tank	150		*	*			*				
Glacier Bay (Home Depot)	Aragon IV	164963	175		*	*			*				
American Standard	Ravenna	3454 bowl, 4096 tank	200		*	*			*				
Corona	Orchid	8510	200		*	*			*				
Mancesa	San Marino	2262W bowl, 2261W tank	200		*		*		*				
St. Thomas	Marathon	6201.01	200		*	*			*				
American Standard	Plebe	3344 bowl, 4392 tank,	225		*		*		*				
Mancesa	Windsor	2700W bowl, 2711W tank	225		*	*			*				
Duravit	Starck 2	16301	250	*			*		*				
Foremost	Rona	TL-8257-TTG-WW	250		*	*			*				
Jacuzzi	Era	BM06	250	*			*		*				
Kohler	Devonshire	K-3457: 4269 bowl, 4619 tank	250		*		*		*				
Kohler	Memoirs	K-3452: 4257 bowl, 4454-U tank (lined)	250		*	*			*				
Kohler	Wellworth	K3422: 4276 bowl, 4620 tank	250		*		*		*				
Established MaP Minimum Performance Threshold - 250 grams													
Foremost	Victorian	LL-1207-W bowl, T-1207-W tank	275		*	*			*				
Mansfield	Alto	130 bowl, 161 tank	275		*	*			*				
Glacier Bay (Home Depot)	All-In-One	TG-4200-WL	300		*	*			*				
Globe Union	C21682	C21682: C53682 bowl, C60321 tank	300		*	*			*				
Jacuzzi	Perfecta	BN30959 bowl, BN30-BN31 tank	300		*		*	*	*				
Kohler	Sterling Karsten	402025: 402021 bowl, 402023 tank	300		*	*			*		*		
Kohler	Sterling Rockton	402027: 402026 bowl, 402022 tank	300		*		*		*		*		
Kohler	Wellworth	K3423: 4277 bowl, 4620 tank	300		*	*			*				
Vortens-Lamosa	GTA	3200 bowl, 3412 tank	300		*	*			*				
Western Pottery	Clinton 832	832 bowl, ULF-8 tank	300		*		*		*				
American Standard	Sonoma	3338 bowl, 4392 tank	325		*	*			*				
Eljer	Toronto Savoy	091-0280: 131-2120 bowl, 141-0260 tank	325		*	*			*				
Foremost	Premier / Lilas	TL-5101-WL	325	*		*			*				
Kohler	Sterling Rockton	402024: 402021 bowl, 402022 tank	325		*	*			*		*		
TOTO	Ultimate	MS854114	325	*			*		*				
Crane	SureFlush	31352: 31192 bowl, 31242 tank	350		*	*			*				
Crane	VIP Flush	3996: 3991 bowl, 3976 tank	350		*		*						
Foremost	Regent	LL-5207-W bowl, T-5207-W tank	350		*	*			*				
Jacuzzi	Perfecta	BN31959 bowl, BN30-BN31 tank	350		*	*			*				
Kohler	Sterling Karsten	402028: 402026 bowl, 402023 tank	350		*		*		*		*		
Mancesa	St. Michelle	2360 bowl, 4260 tank	350		*	*			*				
Vortens-Lamosa	Palermo	3126	350	*		*			*				

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Make	Model	Model Number	MaP Flush Performance (HIGHER IS BETTER)	1-piece model	2-piece model	Round Front Bowl	Elongated Bowl	ADA / Comfort Height	1.6G (6L) Gravity-flush	1.6-G (6-L) Power OR Pressure-Assist	Dual-Flush	Max 1.1-G (4-L) Pressure-Assist	Max 1.28 G (4.8 L) Gravity
Zurn	EcoVantage RF	Z5551	350		*	*			*				
Briggs	Vacuity	4200	375		*		*						
Crane	Cranada Pro II / Galaxy Elite II	3792: 3372 bowl, 3742 tank	375		*		*		*				
Foremost	Premier / Lilas	LL-8207-W bowl, T-8207-W tank	375		*	*			*				
Vortens-Lamosa	Vienna RF Dual-Flush	3208 bowl, 3420 tank	375		*	*			*		*		
Western Pottery	Aris 822	822 bowl, ULF-8 tank	375		*	*			*				
Capizzi	Turbo Capizzi Low Profile	0478 bowl, 1513 tank	400		*		*					*	
Gerber	Aquasaver (1-pc)	21-015	400	*			*		*				
Peerless Pottery (by Capizzi)	Predator Low Profile	606 bowl, 1 tank	400		*		*					*	
Pegasus (Home Depot)	Tulip (See Vortens-Lamosa below)	3107 bowl, 3427 tank (HD SKU SKU 477-546)	400		*		*		*		*		
TOTO	Ultimate	MS853113	400	*		*			*				
Vortens-Lamosa	Pegasus Tulip (Home Depot brand)	3107 bowl, 3427 tank (HD SKU SKU 477-546	400		*		*		*		*		
Western Pottery	Dual Flush	812 DF bowl, ULF-8 DF tank	400		*		*		*		*		
Eljer	Patriot	131-2175 bowl, 141-0220 tank	425		*		*	*	*				
Eljer	Patriot Savoy	091-0220: 131-2120 bowl, 141-0220 tank	425		*	*			*				
Crane	Cranada Pro II / Galaxy Elite II	3782: 3352 bowl, 3742 tank	450		*	*			*				
Globe Union	C21672	C21672: C53672 bowl, C60321 tank	450		*		*	*	*				
Vortens-Lamosa	Genova	3121 bowl, 3421 tank	450		*		*		*				
Capizzi	Capizzi	0778 bowl, 1278 tank	475		*		*					*	
Vitra	Dual Flush	5076 bowl, 5055 tank	475		*	*			*		*		
Briggs	Vacuity	4210: 4310 bowl, 4400 tank	500		*	*							
Capizzi	Turbo Capizzi High Profile	0478 bowl, 1578 tank	500		*		*					*	
Capizzi	Turbo Capizzi Low Profile ADA	0441 bowl, 1513 tank	500		*		*	*				*	
Caroma	Caravelle 270	989760: 609159 bowl, 629435 tank	500		*	*			*		*		
Caroma	Caravelle One-Piece	989646	500	*		*			*		*		
Crane	SureFlush	31362: 31202 bowl, 31242 tank	500		*		*		*				
Crane	SureFlush	31372: 31212 bowl, 31242 tank	500		*		*	*	*				
Eljer	Patriot Savoy	091-0225: 131-2125 bowl, 141-0220 tank	500		*		*		*				
Gerber	Viper	21-512: 21-562 bowl, 28-590 tank	500		*	*			*				
Kohler	Santa Rosa	K-3323	500	*			*		*				
Peerless Pottery (by Capizzi)	Predator ADA	608 bowl, 1 tank	500		*		*	*				*	
Vitra	Arkitekt	5065 bowl, 5066 tank	500		*		*	*				*	
Mansfield	QuantumOne	147 bowl, 153 tank	525		*		*					*	
American Standard	FloWise	2073: 3018 bowl, 4023 tank	550		*		*						*
Caroma	Tasman 270	989860: 270 Bowl, Tasman 270 tank	550		*	*			*		*		
Crane	VIP	3997: 3992 bowl, 3976 tank	550		*	*							
Eljer	Aquasaver	091-7025: 131-7025 bowl, 141-7000 tank	550		*		*			*			
Glacier Bay (Home Depot)	Westminster	445-684 bowl, 455-685 tank (lined)	550		*	*			*				
Mansfield	Montclaire	107 bowl, 108 tank	550		*		*	*	*				
Mansfield	Quantum Rear-Discharge	149 bowl, 123 tank	550		*		*			*			
TOTO	CST703	CST703: C703 bowl, ST703 tank	550		*	*			*				
Vortens-Lamosa	Rhodas	3123 bowl, 3433 tank	550		*		*	*	*		*		
Vortens-Lamosa	Vienna II	3208 bowl, 3412 tank	550		*	*			*				

Maximum Performance (MaP) of Toilet Fixtures - Sorted by PERFORMANCE

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Make	Model	Model Number	MaP Flush Performance (HIGHER IS BETTER)	1-piece model	2-piece model	Round Front Bowl	Elongated Bowl	ADA / Comfort Height	1.6G (6L) Gravity-flush	1.6-G (6-L) Power OR Pressure-Assist	Dual-Flush	Max 1.1-G (4-L) Pressure-Assist	Max 1.28 G (4.8 L) Gravity
Vortens-Lamosa	Vienna RF (Lined)	3208 bowl, 3464L tank (lined)	**550**		*	*			*				
Vortens-Lamosa	Vienna Victory	3209 bowl, 3412 tank	**550**		*	*			*				
Caroma	Royale 305	609151 bowl, 624530 tank	**600**		*	*			*		*		
Duravit	Happy D	017009 bowl, 091000-05 tank	**600**		*	*			*		*		
Duravit	Happy D Wallmount	017109 bowl, 111-335 tank (in wall)	**600**		*	*			*		*		
Kohler	Cimarron	K-3497: 4287-0 bowl, 4634-0 tank	**600**		*	*			*				
Mansfield	Magnum	722	**600**	*			*		*				
Niagara	Flapperless Muskoka ADA EL	N2217: 2217 bowl, 2217 tank	**600**		*		*	*	*				
Niagara	Flapperless Muskoka ADA RF	N2217R: 2217R bowl, 2217 tank	**600**		*	*		*					
Niagara	Flapperless Superior EL	N2218	**600**	*			*	*	*				
RAK Ceramics	Washington Syphonic EL	171 bowl, WT20 tank	**600**		*		*		*				
Vitra	Atlantis ADA EL	5052 bowl, 6853 tank	**600**		*		*	*	*				
Vortens-Lamosa	Vienna RF (Unlined)	3208 bowl, 3464V tank (unlined)	**600**		*	*			*				
Gerber	Ultra Flush	21-310: 21-374 bowl, 28-380 tank	**625**		*		*			*			
TOTO	Carlyle	MS874114SG	**625**	*			*		*				
American Standard	Champion (1-pc)	2004	**650**	*			*		*				
Briggs	Vacuity	4245: 4345 bowl, 4400 tank	**650**		*		*						
Caroma	Caravelle 305	989680: 609151 bowl, 629435 tank	**650**		*	*			*		*		
Caroma	Reflections 270	989720: 609159 bowl , 629530 tank	**650**		*	*			*		*		
Mancesa	Cyclone	2282 bowl, 2281 tank	**650**		*		*					*	
Mansfield	Maverick	101 bowl, 102 tank	**650**		*		*		*				
RAK Ceramics	Compact Syphonic EL	CT30 bowl, CT65 tank	**650**		*		*	*	*				
TOTO	Carusoe	CST715: C715 bowl, ST706 tank	**650**		*	*			*				
TOTO	Dalton	CST734: C734F bowl, ST733 tank	**650**		*		*	*	*				
Mansfield	QuantumOne	146 bowl, 153 tank	**675**		*	*						*	
Mansfield	QuantumOne	148 bowl, 153 tank	**675**		*		*	*				*	
TOTO	Clayton (nee Baldwin)	CST784: C784SF bowl, ST784S tank	**675**		*		*	*	*				
TOTO	Plymouth	MS924154F	**675**	*			*		*				
Briggs	Hathaway Vacuity	4360 bowl, 4460 tank	**700**		*		*						
TOTO	Ultramax	MS854114S	**700**	*			*		*				
Vitra	Riva	4117 bowl, 6952 tank	**700**		*		*		*				
Vortens-Lamosa	Tornado EL	3138 bowl, 3468 tank	**700**		*		*					*	
Crane	Economiser	3835: 3825 bowl, 3612 tank	**725**		*		*			*			
Crane	VIP Flush	3995: 3990 bowl, 3976 tank	**725**		*	*							
Niagara	Flapperless RF	N2216	**725**		*	*			*				
American Standard	Cadet	2333: 4098 tank, 3099 bowl	**750**		*		*			*			
Crane	Economiser	3834: 3824 bowl, 3612 tank	**750**		*	*				*			
Vitra	Altantis EL	5051 bowl, 6853 tank	**750**		*		*		*				
Vitra	Corina (1-pc)	5178	**750**	*			*		*				
American Standard	Colony / Afton	4392.016 tank, 3038 bowl	**775**		*	*			*				
American Standard	Colony / Afton (lined tank)	4392.500 tank, 3038 bowl	**775**		*	*			*				
American Standard	Champion (1-pc)	2034	**800**	*			*	*	*				
American Standard	Champion Round Front	2023: 3110 bowl, 4260 tank	**800**		*	*			*				
American Standard	Champion Select	2035: 3110 bowl, 4272 tank	**800**		*	*			*				
American Standard	Doral Champion	2369: 3110 bowl, 4272 tank	**800**		*	*			*				
American Standard	Doral Classic Champion	2076: 3110 bowl, 4281 tank	**800**		*	*			*				
American Standard	Glenwall	3402 bowl, 4098 tank	**800**		*		*			*			
Caroma	Caravelle 270 ADA	989770: 609177 bowl, 687180 tank	**800**		*	*		*	*		*		

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Make	Model	Model Number	MaP Flush Performance (HIGHER IS BETTER)	1-piece model	2-piece model	Round Front Bowl	Elongated Bowl	ADA / Comfort Height	1.6G (6L) Gravity-flush	1.6-G (6-L) Power OR Pressure-Assist	Dual-Flush	Max 1.1-G (4-L) Pressure-Assist	Max 1.28 G (4.8 L) Gravity
Gerber	Ultra Flush	EF 21-318: 21-377 bowl, EF-28-380 tank	**800**		*		*	*				*	
Gerber	Ultra Flush	EF-21-312: 21-372 bowl, EF-28-380 tank	**800**		*		*	*				*	
Gerber	Ultra Flush	EF-21-314: 21-372 bowl, EF-28-384 tank	**800**		*		*	*				*	
Gerber	Ultra Flush	EF-21-324: 21-372 bowl, EF-28-384 tank	**800**		*		*	*				*	
Gerber	Ultra Flush	EF-21-325: 21-375 bowl, EF-28-380 tank	**800**		*		*	*				*	
Globe Union	C21692	C21692: C53692 bowl, C60321 tank	**800**		*		*		*				
Kohler	Bancroft Comfort Height	K-3487: 4281 bowl, 4633 tank	**800**		*		*	*	*				
Kohler	Cimarron	K-3496: 4286-0 bowl, 4634-0 tank	**800**		*		*	*	*				
Kohler	Cimarron Comfort Height	K-3489	**800**	*			*	*	*				
Kohler	Highline Pressure Lite	K-3493: 4304 bowl, 4645 tank	**800**		*		*			*			
Kohler	Memoirs	K-3451 (Classic tank lid)	**800**	*			*		*				
Kohler	Memoirs	K-3453 (Stately tank lid)	**800**	*			*		*				
Kohler	Purist	K-3492 Power-Assisted	**800**	*			*			*			
TOTO	Aquia	CST 414: CT414 bowl, ST 413 tank	**800**		*		*		*		*		
Vitra	Altantis RF	5050 bowl, 6853 tank	**800**		*	*			*				
Vitra	Dual Fush Comfort EL	5074 bowl, 5055 tank	**800**		*		*	*	*		*		
Vitra	Mona	4117 bowl, 4015 tank	**800**		*		*		*				
Zurn	EcoVantage Dual Flush EL	Z5572	**800**		*		*			*	*		
Zurn	EcoVantage EL	Z5570	**800**		*		*			*			
Zurn	EcoVantage EL	Z5571	**800**		*		*					*	
Mansfield	EcoQuantum	147 bowl, 119 tank	**825**		*		*			*	*		
Mansfield	Quantum	147 bowl, 123 tank	**825**		*		*			*			
Vitra	Corina	5068 bowl, 5070 tank	**825**		*	*			*				
Caroma	Royale 305 EL	609130 bowl, 629530 tank	**850**		*		*		*		*		
Foremost	Premier / Lilas	LL-8207-HC bowl, T-8207 tank	**850**		*		*	*	*				
Kohler	San Rafael Power Lite	K-3398 Power-Assisted	**850**	*			*			*	*		
Mansfield	EcoQuantum	146 bowl, 119 tank	**850**		*	*				*	*		
Mansfield	Quantum	146 bowl, 123 tank	**850**		*	*				*			
Vitra	Corina	5069 bowl, 5070 tank	**850**		*		*		*				
Vitra	Corina (1-pc)	5209	**850**	*		*			*				
Eljer	Titan	091-0777: 131-0777 bowl, 141-0777 tank	**900**		*		*	*	*				
Gerber	Ultra Flush	21-300: 21-342 bowl, 28-385 tank	**900**		*	*				*			
Gerber	Ultra Flush	21-302: 21-342 bowl, 28-380 tank	**900**		*		*			*			
Gerber	Ultra Flush	21-304: 21-342 bowl, 28-384 tank	**900**		*	*				*			
TOTO	Drake	CST744S: C744 bowl, ST743 tank	**900**		*		*		*				
Mansfield	EcoQuantum	148 bowl, 119 tank	**925**		*		*	*		*	*		
Mansfield	Quantum	148 bowl, 123 tank	**925**		*		*	*		*			
American Standard	Champion Elongated	2018: 3121 bowl, 4260 tank	**1,000***		*		*		*				
American Standard	Champion Right Height	2002: 3225 bowl, 4260 tank	**1,000***		*		*	*	*				
American Standard	Champion Select	2057: 3225 bowl, 4272 tank	**1,000***		*		*	*	*				
American Standard	Champion Select	2087: 3121 bowl, 4272 tank	**1,000***		*		*		*				
American Standard	Doral Champion	2367: 3225 bowl, 4272 tank	**1,000***		*		*	*	*				
American Standard	Doral Champion	2368: 3121 bowl, 4272 tank	**1,000***		*		*		*				
American Standard	Doral Classic Champion	2058: 3225 bowl, 4281 tank	**1,000***		*		*	*	*				
American Standard	Doral Classic Champion	2074: 3121 bowl, 4281 tank	**1,000***		*		*		*				

Maximum Performance (MaP) of Toilet Fixtures - Sorted by PERFORMANCE

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Make	Model	Model Number	MaP Flush Performance (HIGHER IS BETTER)	1-piece model	2-piece model	Round Front Bowl	Elongated Bowl	ADA / Comfort Height	1.6G (6L) Gravity-flush	1.6-G (6-L) Power OR Pressure-Assist	Dual-Flush	Max 1.1-G (4-L) Pressure-Assist	Max 1.28 G (4.8 L) Gravity
American Standard	Flush Right Cadet 3	2383: 3014 bowl, 4021 tank	1,000*		*		*		*				
American Standard	Oakmont Champion El Right Ht	2738: 3101 bowl, 4272 tank	1,000*		*		*	*	*				
American Standard	Oakmont Champion Elongated	2625: 3153 bowl, 4272 tank	1,000*		*		*		*				
American Standard	Oakmont Champion Round Front	2627: 3167 bowl, 4272 tank	1,000*		*	*			*				
American Standard	Skyline Champion EL	3225 bowl, 4077 tank	1,000*		*		*	*	*				
American Standard	Skyline Champion RF	3110 bowl, 4077 tank	1,000*		*	*			*				
American Standard	Townsend Champion EL Right Ht	2733: 3177 bowl, 4281 tank	1,000*		*		*	*	*				
American Standard	Townsend Champion RF Right Ht	2735: 3180 bowl, 4281 tank	1,000*		*	*		*	*				
American Standard	Yorkville	2320: 3120 bowl, 4099 tank	1,000*		*		*			*			
Gerber	Ultra Dual Flush	DF-21-302: 21-342 bowl, DF-28-380 tank	1,000*		*	*				*	*		
Gerber	Ultra Dual Flush	DF-21-304: 21-342 bowl, DF-28-384 tank	1,000*		*	*				*	*		
Gerber	Ultra Dual Flush	DF 21-318: 21-377 bowl, DF-28 380 tank	1,000*		*		*	*		*	*		
Gerber	Ultra Dual Flush	DF-21-312: 21-372 bowl, DF-28-380 tank	1,000*		*		*			*	*		
Gerber	Ultra Dual Flush	DF-21-314: 21-372 bowl, DF-28-384 tank	1,000*		*		*			*	*		
Gerber	Ultra Dual Flush	DF-21-324: 21-377 bowl, DF-28-384 tank	1,000*		*		*	*		*	*		
Gerber	Ultra Dual Flush	DF-21-325: 21-375 bowl, DF-28-380 tank	1,000*		*		*	*		*	*		
Gerber	Ultra Flush	21-311: 21-372 bowl, 28-385 tank	1,000*		*		*	*		*			
Gerber	Ultra Flush	21-312: 21-372 bowl , 28-380 tank	1,000*		*		*			*			
Gerber	Ultra Flush	21-314: 21-372 bowl , 28-384 tank	1,000*		*		*			*			
Gerber	Ultra Flush	21-317: 21-377 bowl, 28-385 tank	1,000*		*		*	*		*			
Gerber	Ultra Flush	21-318: 21-377 bowl, 28-380 tank	1,000*		*		*	*		*			
Gerber	Ultra Flush	21-324: 21-377 bowl, 28-384 tank	1,000*		*		*	*		*			
Gerber	Ultra Flush	21-325: 21-375 bowl, 28-380 tank	1,000*		*		*	*		*			
Gerber	Ultra Flush	EF-21-302: 21-342 bowl, EF-28-380 tank	1,000*									*	
Gerber	Ultra Flush	EF-21-304: 21-342 bowl, EF-28-384 tank	1,000*		*	*						*	
Kohler	Barrington Pressure Lite	K-3554: 4327 bowl, 4645 tank	1,000*		*		*			*			
Kohler	Wellworth Pressure Lite	K-3505: 4303 bowl, 4645 tank	1,000*		*		*			*			
Vitra	Corina Comfort EL	5232 bowl, 5070 tank	1,000*		*		*	*	*				
Western Pottery	Challenger Hi-Boy	872 bowl, ULF-8 tank	1,000*		*		*		*				
Zurn	EcoVantage ADA EL	Z5561	1,000*		*		*	*				*	
Zurn	EcoVantage ADA EL	Z5560	1,000*		*		*	*		*			
Zurn	EcoVantage Dual Flush ADA EL	Z5562	1,000*		*		*	*		*	*		

Age-Friendly Home Design

adapting homes for independent lifestyles

Ayala Rahav

SafetyCare™

Synopsis

- *Homes that were very comfortable for baby boomers can easily turn into hazardous environments for older people.*
- *Before venturing into a major modification project, it may be worth taking a thorough look at your home, and through simple alterations, prevent almost 30 percent of the accidents that occur at home.*

"Aging-In-Place"

"Baby boomers" (the generation born between 1946 and 1964) and seniors today strive for an ageless active lifestyle. In the U.S. alone, there are between 70 to 80 million baby boomers, aged around 40 to 60. As they age, almost 80 percent prefer to stay in their current homes as long as they can still maintain an independent lifestyle. This phenomenon, called "aging-in-place," means that as people grow older, they still want, regardless of their physical ability, income, or age, to remain safely and securely in their current homes.

Many families foster the ability of their elders to age in their home environments—a place which is familiar to them, where they know their way around. Yet, aging-in-place necessitates redesign and modification of their homes to make them age-friendly, while ensuring they remain a secure and comfortable place that facilitates independent living. This is extremely important because for older people daily routines become more difficult due to age-related decline in physical, movement, and cognitive capabilities.

Home areas that were very comfortable for baby boomers can easily turn into hazardous environments for older people. Before venturing into a major modification project, it may be worth taking a thorough look at your home and through simple alterations prevent almost 30 percent of the accidents that occur at home.

> "...aging-in-place necessitates redesign and modification of their homes to make them age-friendly, while ensuring they remain a secure and comfortable place that facilitates independent living."

Declining Capabilities

Capabilities decline with age. Hand-grip strength of a person 75-years-old is half as strong as a person at 40. Muscle power, muscle strength, and flexibility-decline show even sharper differences. For example, if an older person tripped, the muscle power required to restore the body's equilibrium to avoid falling requires rapid, powerful reactions much quicker and stronger than can be found in elderly persons. Women are 30 percent physically weaker than men, and that makes them all the more frail and accident prone. Other declining capabilities relate to all sorts of age-related illnesses and chronic situations that further limit stability, functionality, and dexterity.

Old age also brings with it shrinkage in height. People ages 65 and over lose up to four inches (about 10 cm) in height, so surface and cabinet heights, handles, and peep holes need to be adjusted to accommodate their habitants' altered height.

As sensory capabilities decline with age, the information received through our senses—hearing, sight, smell, touch—becomes less reliable, thus creating a need for a higher level of information input (stronger illumination, larger fonts, louder voice, stronger smell) to be able to assess and react to incoming information.

Since we cannot change the bodily decline, the principles of turning homes into age-friendly habitats rely on the concepts of universal design, or as we call it, "age-friendly design." Basically, it is how to transparently adapt the environments so that they are accessible, usable, simple, intuitive, and safe for members of the family who are more fragile, such as the elderly, people who are physically challenged, and children. A good age-friendly design will bridge the gap of age-related reduced and slowed capabilities.

Applied Universal Design

But how is it possible to apply universal design concepts in order to enhance home safety and security for the mature population?

Take a good look at all areas of your home and ask yourself questions concerning suitability for mature age user-friendliness, safety, and comfort. Flooring, electricity, heating/cooling, and almost all areas that comprise the home need to be reconsidered and adapted to the needs and constraints of older people.

Consider potential mishaps and prepare. For example, the main level of your home should include a bedroom and bathroom in the event a family member is bed-ridden or can't climb stairs, but still wants to take part in the family life. Additionally, the main entry door and bedroom and bathroom doors need to be wide enough to accommodate a wheelchair, should one become necessary.

Stairs, steps, thresholds, and hallways can be hazardous. Facilitate stability and make sure that these areas are well lit and there are gripping handles designed so that they can be usable by people with arthritis as well.

Enable comfort of movement with age-friendly reaching to fixtures and appliances. Look at the floors and rugs and make sure they have firm pads to avoid slipping and that they facilitate a range of movement. See that all surfaces are slip-resistant. In the bathroom, add grab bars, place stools in the showers, and install a low-step bathtub and comfort height toilet. In the hallways, widen doorways, make sure thresholds are at the same height with flooring, and secure the corners and edges of area rugs. Doors and windows should open easily, and handles should be at the right height for older people to reach to open and close. The handle grip should be comfortable and safe.

Make sure that lighting is everywhere, accessible, and clear—both in the exterior area in front and in the rear of the home, in hallways, and near stairs and steps. Light switches should be placed at the right height, near every room entrance, and inside closets. Use color contrasts to indicate crucial points or functions.

Facilitate accessibility and reaching out to electrical switches, thermostats, and electrical outlets. Compensate for mobility and motion limitations by height-adjustable cabinets in the kitchen and bathrooms. See that shelves and cabinets are reached easily through pull-out shelves. Add rolling storage carts under cabinets and faucets with level handles. Make sure that there are comfortable sitting areas and working areas.

To help the lack of dexterity and muscle weakening, facilitate gripping with comfortable handles on drawers and cabinets with easy gliding drawers. Make sure that appliances are installed at the right height, at least 18 inches above the floor.

To overcome memory and cognitive decline, provide cues, signals, and reminders for basic functions at home by combining voice and visual signs for safety (gas leakage, slippery areas, electricity, etc.) or repetitive home-related functions that are part of the independent daily routine.

These are just preliminary considerations and remedies—and even these offer already a significant improvement when practiced. However, a word of caution: Don't turn your home into a disability realm. Make the adjustments and installations as transparent and mature age user-friendly as possible. Do not offend or label by installing explicit disability accessories unless absolutely necessary. Older people want first and foremost to remain part of an ageless society. Universal design and appropriate choice of accessories should give the feeling of active, natural, and independent lifestyle, maintained health and independence, and at the same time overcome the difficulties seamlessly, true to the philosophy that "what is excellent for older people is very good for younger people as well." UHD

The Author

Ayala Rahav is a principal in Senior Touch, a company based in Israel, which brings older age-related needs and factors as primary considerations into the world of products, services, content, and mature lifestyle management. She is an expert in end-user centricity, high-tech, media, business development, and generational and segmented marketing. She can be reached at ayala@senior-touch.com

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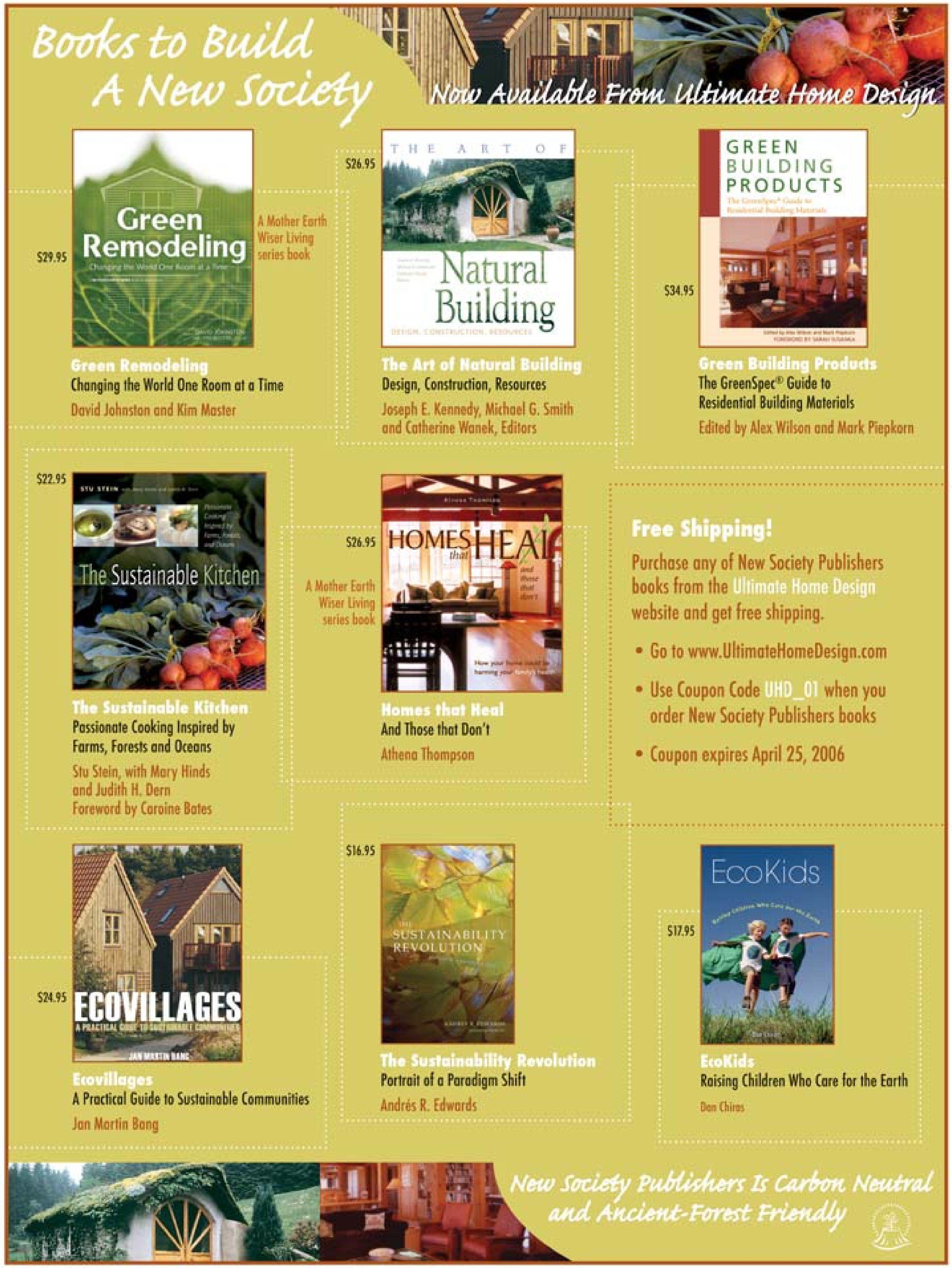

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